OPERATION MARKETING

APRIL
1959

FOUNDRY

A PENTON PUBLICATION

A Special Report . . . Page 100

Marketing Is Only Common Sense

Managing a Foundry Professionally

Good Casting Design Means More Sales

Casting Conferences—A Marketing Tool

How To Achieve Profitable Growth

Castings Congress and
Engineered Castings Show
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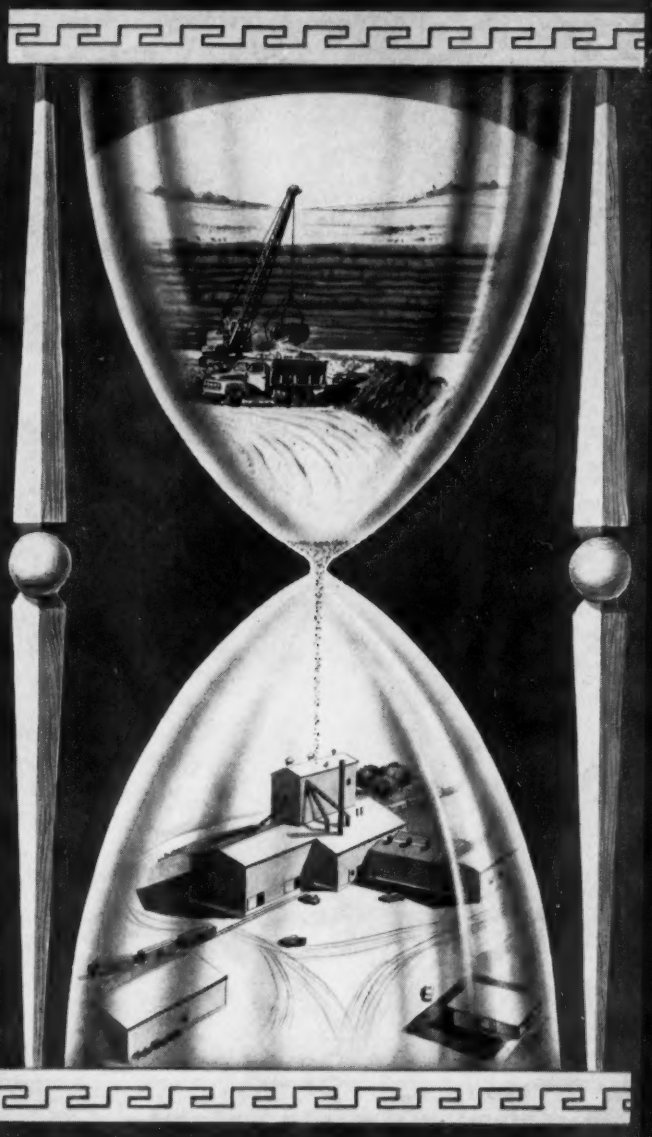
TIME WILL TELL...



SUPPLY...

should have an important bearing on any foundry's decision to standardize with one bentonite brand. Any abrupt change in the clay's characteristics due to depletion of the supplier's original reserves can needlessly disrupt casting operations in the future.

More than 200,000 tons of the finest collodial bentonite, YELLOWSTONE, are stockpiled at Magcobar's Greybull, Wyoming, facilities, along with more than 20,000,000 tons of the purest known western bentonite ore in reserve. The world's largest mine – the world's largest reserves!

DEMAND...

for Magcobar's YELLOWSTONE continues to increase as more and more progressive foundries discover that up to ten percent less of this pure, uniform clay is required. Uniform green strength, tensile strength and permeability are controlled at the plant to assure consistent specifications.

The next time you order bentonite, demand YELLOWSTONE Bentonite – your guarantee of dependable supply and uniform quality. Write for technical bulletins numbers 1 and 2 entitled "Bentonite Evaluation" and "Bentonite and the Muller."

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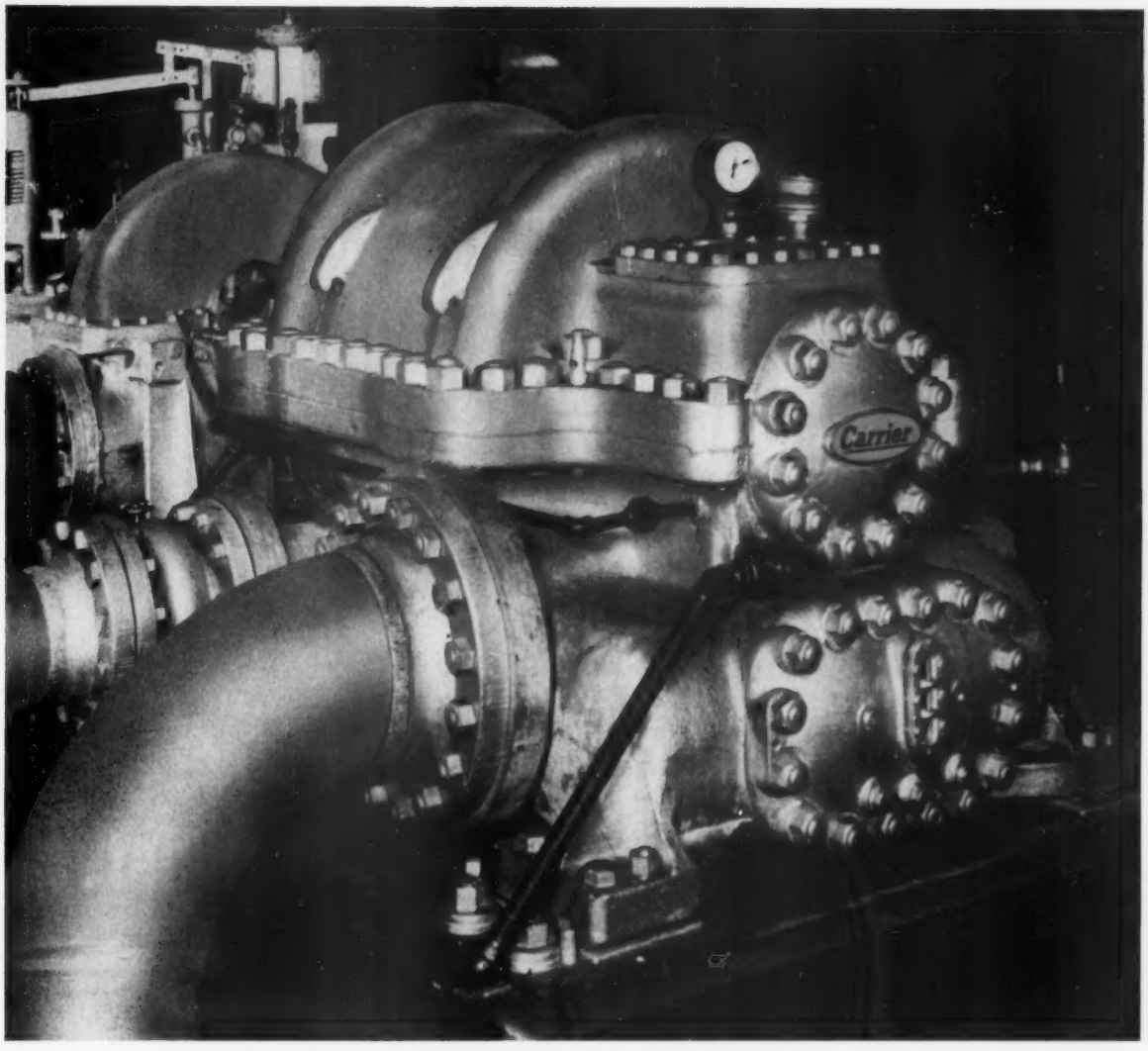

4½% Nickel plus good casting makes these casings strong and tough at–185°F

Here's how the foundry solved a low temperature problem:

This Carrier #350 Compressor is designed for producing ethylene by low temperature (–185°F) high pressure (600 psi) fractionation.

Under these conditions ordinary cast steel is brittle and could easily fracture. Could the foundry turn out castings which would have high strength and toughness at the low temperatures involved?

They could . . . this way:

They made these three-ton compressor housing castings from 4½% nickel alloy steel; normalized and water quenched them, and finally tempered them. Under this treatment the castings easily exceed these minimum mechanical properties:

Ultimate tensile strength	70,000 psi
Yield strength	40,000 psi
Elongation in 2"	22%
Reduction of area	30%
Charpy keyhole impact (@ –185°F)	15 ft. lb.

Nickel does wonders for cast irons and steels destined for severe service . . . aids development of desired metal structure.

Recommend Nickel Alloys Freely

Nickel is a plentiful and versatile material and you can count on Inco Nickel's Development and Research Division for information to help you in selecting specific materials to use in particular applications.

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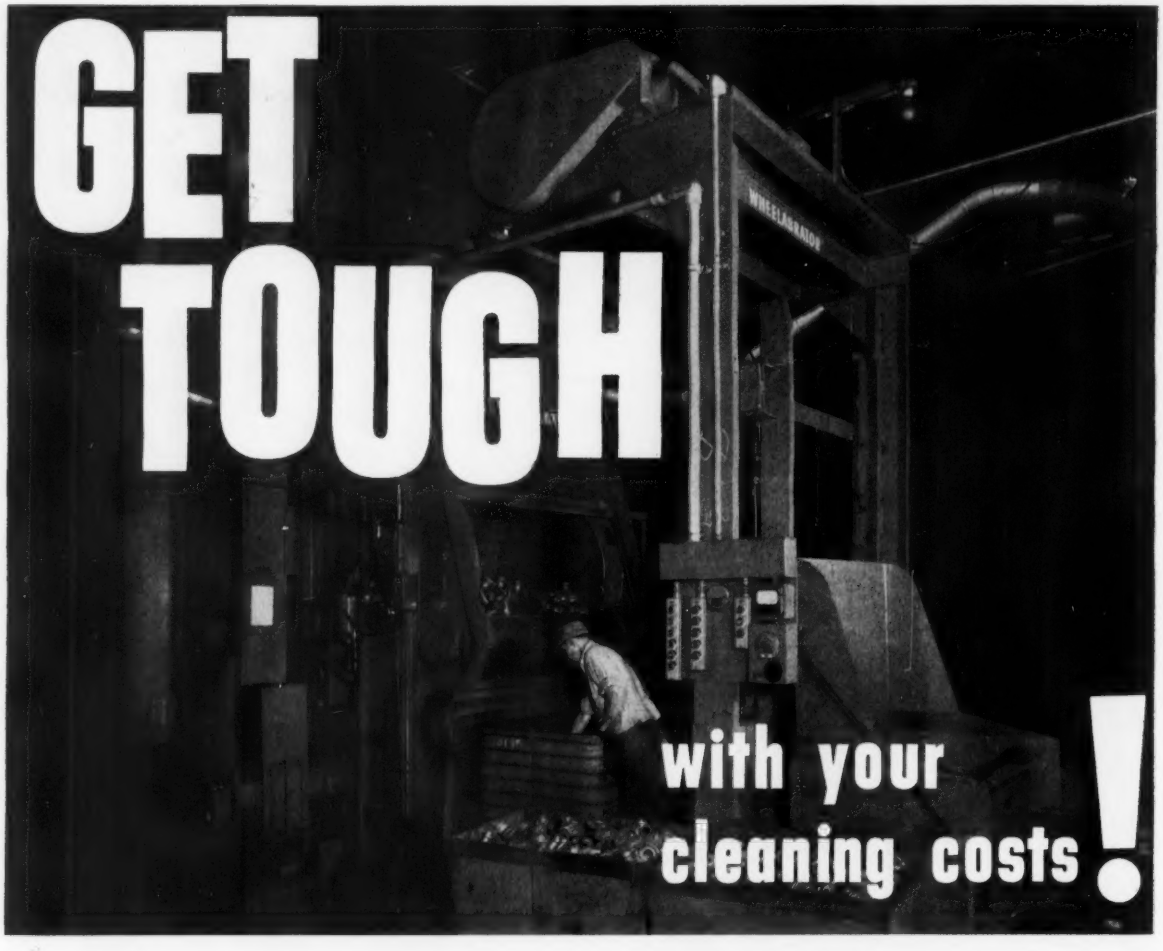


like they did at Canton Malleable Iron Co.

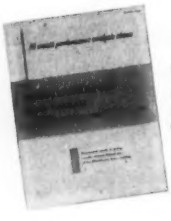
When management at Canton Malleable Iron Co. decided **to get tough** with their cleaning costs, they gained the savings they wanted with a Wheelabrator Super Tumblast®.

Loads that formerly required 30 to 45 minutes of cleaning time now are cleaned in only 9 minutes. The Super Tumblast easily handles more than two tons of small castings per hour — four times the previous volume cleaned with two older batch-type blast cleaning machines.

Sixteen man-hours of cleaning time are saved daily. Maintenance costs are at an all-time low. And with all its increased cleaning power, the Super Tumblast is making big savings in abrasive costs as well.

One of the unique features of this Wheelabrator Super Tumblast is the automatic loader, designed to handle two different sizes of tote boxes. By handling one large tote box or two small ones at the same time, it has substantially eased work-handling problems.

In over 125 installations, the Wheelabrator Super Tumblast has **proved** its unequalled ability to cut cleaning costs through higher production capacity, lower labor requirements, and lower costs for abrasive and maintenance. Get this assurance of results in your attack on cleaning costs, by calling your Wheelabrator Sales Engineer.



Write for this illustrated report of savings actually achieved through use of the Wheelabrator Super Tumblast. Ask for catalog 145-D.

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505 South Byrkit Street Mishawaka, Indiana

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April 1959
Volume 87—Number 4

FOUNDRY
A PENTON PUBLICATION

You can be as happy as the little character in the drawing above. He's delighted because his company's sales have zoomed since management instituted an effective marketing program. For details, see Operation Marketing, a special report which begins on Page 100

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Operation Marketing 100
SPECIAL REPORT: Five articles discuss the various aspects of marketing. Individually, they cover the nature of a marketing program, professional management, profitable growth, casting design, and casting clinics

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Marketing is essential to the continued growth and prosperity of your company. Its goals are to prevent losses to competitive processes and to soften the impact of business cycles—By GEORGE K. DREHER

Managing a Foundry Professionally 110
Superior management enables a business to make profits even when its competitors cannot. This article analyzes the ingredients which make up good management—By GLENN J. COOK

How To Achieve Profitable Growth 115
The growth potential of the foundry industry and of the individual companies which compose it depends on its handling of market research, process research, and institutional advertising—By GREGORY M. BONI

Good Casting Design Can Mean More Sales 118
Because good design can lower cost and improve appearance and performance of castings, it is closely related to the marketing effort. Radiography is a design aid—By JOHN L. FLITZ and DONALD F. RICHTER

Casting Conferences—A Marketing Tool 126
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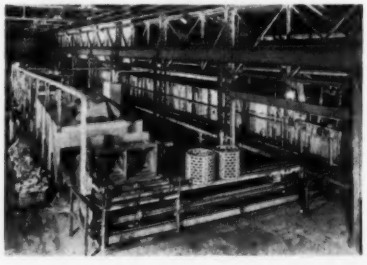
FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly and copyright 1957 by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

THE EDITORS' WORKSHOP

COMING IN MAY: Our Postconvention May issue will present a report on the annual AFS meeting, including the first portion of the technical sessions, as well as regu-



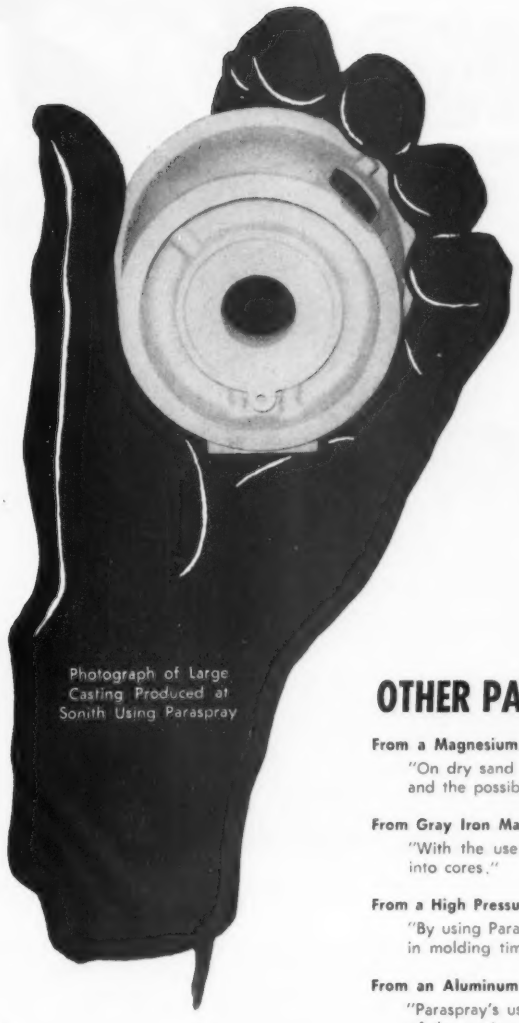
lar departments and a number of articles. One of the latter will describe an automated heat treating installation, shown here, which also will be featured on our cover in full color. In operation at Marion Malleable Iron Works, Marion, Ind., it's 220 ft long.

ON THE GO: Keeping up with the foundry industry is no simple task. As this issue goes to press, for example, Managing Editor Bill Gude is escaping Cleveland's miserable March weather by covering the California Regional and the Western Metals Congress at Los Angeles, an Investment Casting Institute meeting at Santa Monica, and the Texas Regional at San Antonio.

GIFS CLINICS: As the Operation Marketing article on p. 126 reports, casting clinics of various kinds are having considerable success these

days. Most recent is a coast-to-coast series sponsored by the Gray Iron Founders' Society, Cleveland. This shot was taken at the Los Angeles session, last February. Technical Director Charlie Walton is the speaker.

PARASPRAY
helps deliver
BETTER CASTINGS
for Sonith Foundries of FMC



Photograph of Large Casting Produced at Sonith Using Paraspray

Sonith, Producer of Meehanite Castings has this to say about Paraspray

". . . excellent product. On green sand molds your product prevents the sand from drying out and washing when the iron is finally poured. On moderate size molds Paraspray speeds up production. Often circumstances arise when Paraspray is the only solution."

OTHER PARASPRAY USERS EXPRESS ENTHUSIASM

From a Magnesium Foundry . . .

"On dry sand cores it improves the surface finish and helps reduce moisture in the mold and the possibility of loose sand."

From Gray Iron Manufacturer . . .

"With the use of Paraspray we have eliminated core cuts, have no penetration of iron into cores."

From a High Pressure Valve Producer . . .

"By using Paraspray we have been able to show a 50% smoother finish with a big saving in molding time. We get a clean hole, free from rat-tails and fins. It has never failed."

From an Aluminum Company . . .

"Paraspray's use has proven a great boon in increasing production as well as the quality of the castings for our air-cooled cylinder heads."

From a Nickel Bronze Castings Foundry . . .

"Paraspray is the best product that we have found to date for coating green sand molds for 20% nickel bronze castings. Due to its pouring temperature, Paraspray has eliminated any skin drying."

Test Paraspray in your foundry. Discover for yourself why progressive foundrymen depend on Paraspray for better casting at lower cost.

TRIAL OFFER

5 Gallons at Low Drum Price

Specify Metal(s) to be Cast

SUPER PARACOAT Pattern Coating

Patterns draw clean with no mold damage, leaving a smooth finish. Quick-drying Paracoat applies easily, has excellent adhesion.

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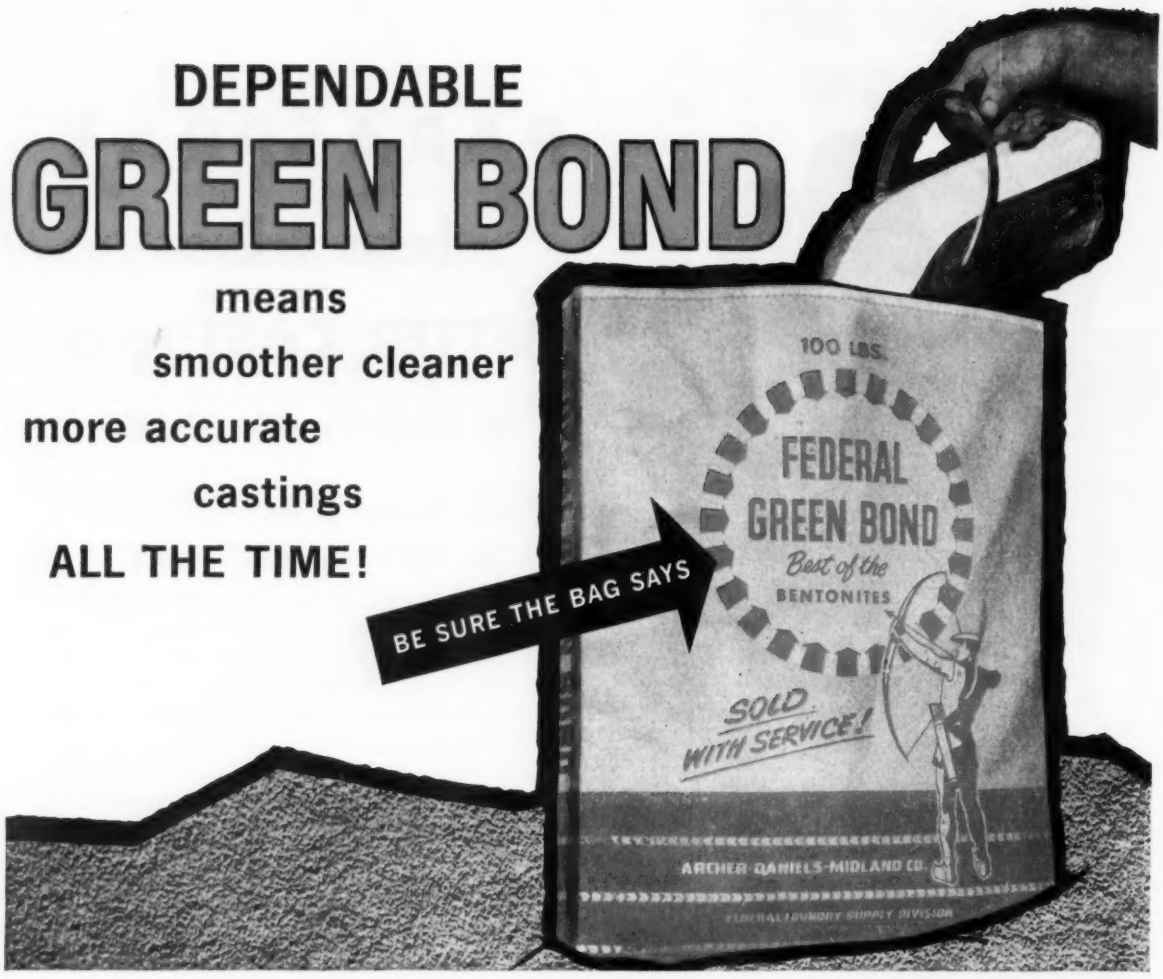
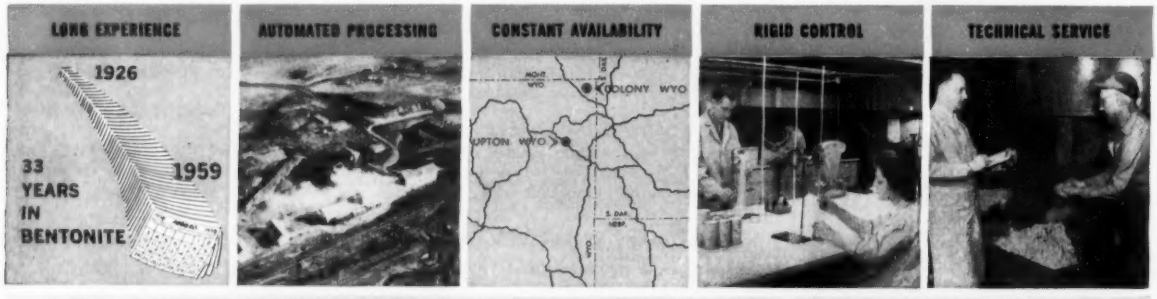
smoother cleaner
more accurate
castings
ALL THE TIME!



5 Good reasons why foundries rely on GREEN BOND



LET A-D-M MAKE UP A MIXED CARLOAD OR TRUCK LOAD

Send for
GREEN BOND
Technical Bulletin

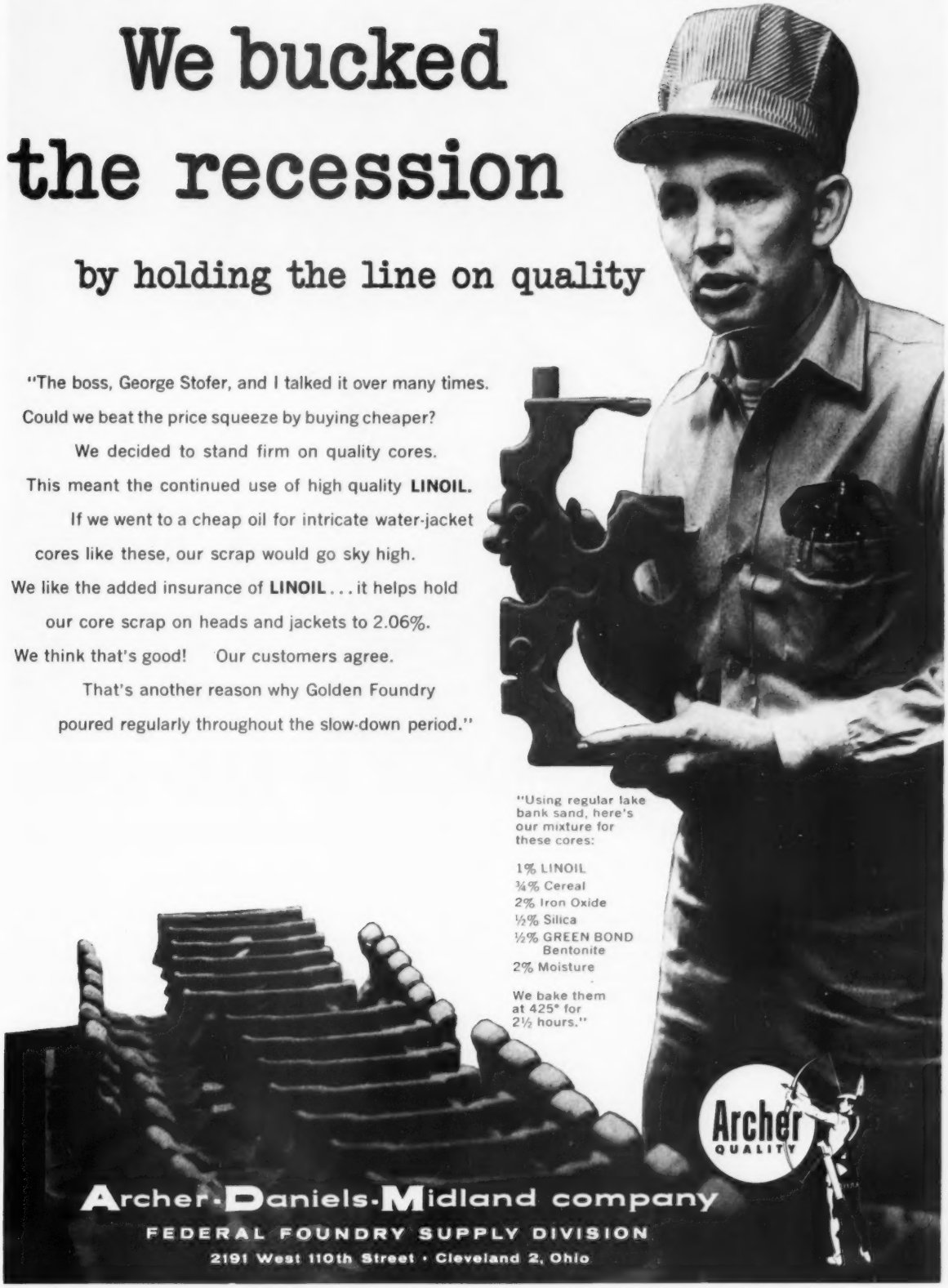
Archer-Daniels-Midland company
FEDERAL FOUNDRY SUPPLY DIVISION
2191 West 110th Street • Cleveland 2, Ohio

Report from Al Floyd, Assistant Core Superintendent, North Core Room, Golden Foundry Company, Inc., Columbus, Indiana:

We bucked the recession

by holding the line on quality

"The boss, George Stofer, and I talked it over many times. Could we beat the price squeeze by buying cheaper? We decided to stand firm on quality cores. This meant the continued use of high quality **LINOIL.** If we went to a cheap oil for intricate water-jacket cores like these, our scrap would go sky high. We like the added insurance of **LINOIL**... it helps hold our core scrap on heads and jackets to 2.06%. We think that's good! Our customers agree. That's another reason why Golden Foundry poured regularly throughout the slow-down period."



"Using regular lake bank sand, here's our mixture for these cores:

1% LINOIL
¾% Cereal
2% Iron Oxide
½% Silica
½% GREEN BOND Bentonite
2% Moisture

We bake them at 425° for 2½ hours."

Archer QUALITY

Archer-Daniels-Midland company

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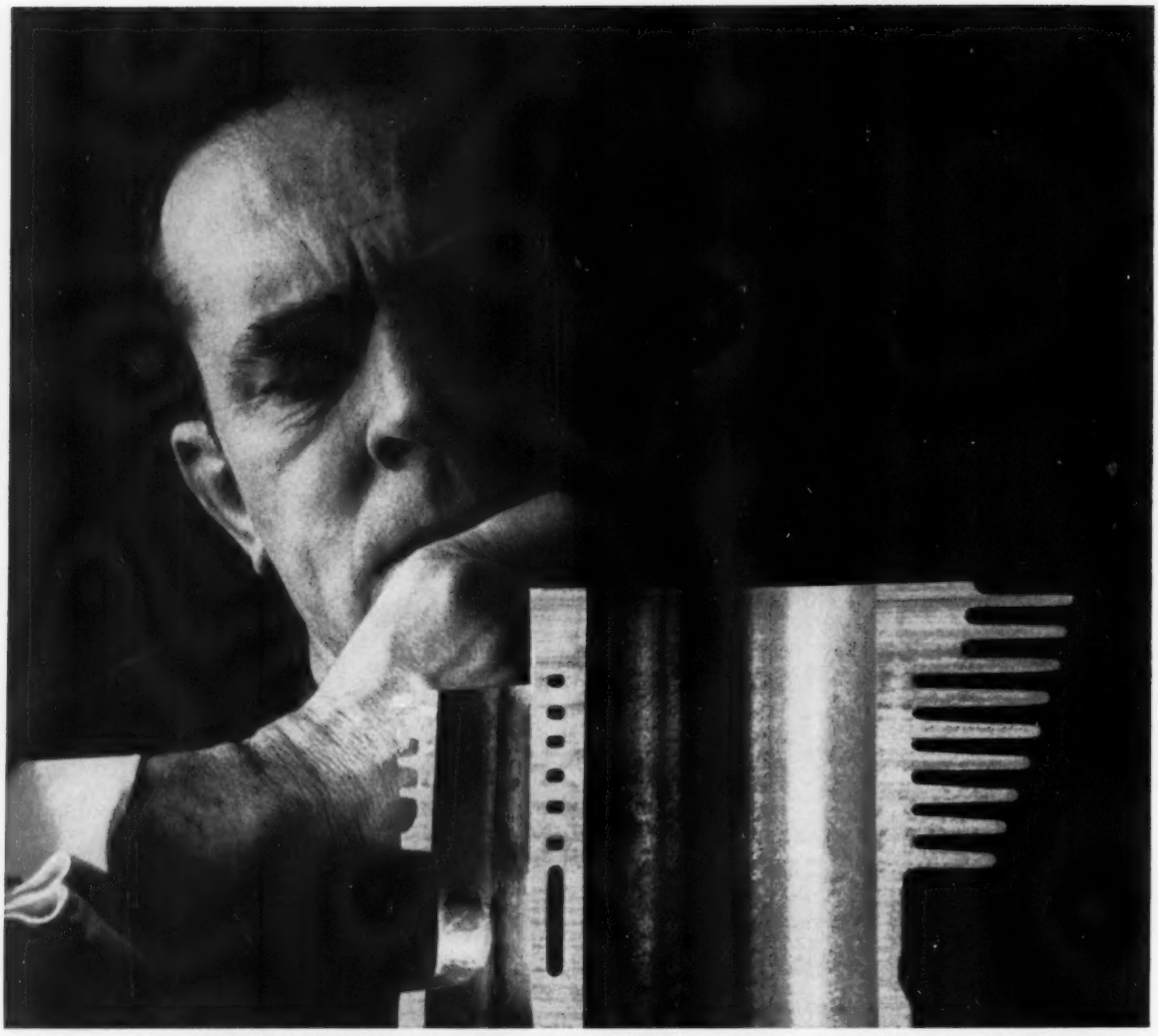

THE PERPLEXING PROBLEM OF HARD SPOTS

Another costly mystery solved–by the man from Kaiser Aluminum

THE PUZZLING FACTS. An aluminum foundryman recently made a disturbing discovery: his castings contained many inclusions and hard spots. These made the castings very unsatisfactory. In addition, they were difficult to machine–and caused excessive wearing of tool bits.

HOW THE CASE WAS SOLVED. It was a frustrating problem. But the man from Kaiser Aluminum found the fault: ineffective fluxing and degassing techniques were being employed. When these were corrected, the hard spots disappeared and production returned to normal.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He's ready to give you expert advice on any casting problem–including mold and die design, alloy selection, heat treatment, finishing, fluxing, metal transfer.

FULL ALLOY AVAILABILITIES. Kaiser Aluminum can supply you *fast* with a wide selection of casting alloys to suit any engineering requirement–from general purpose, low stressed alloys to high purity alloys having good properties at elevated temperatures.

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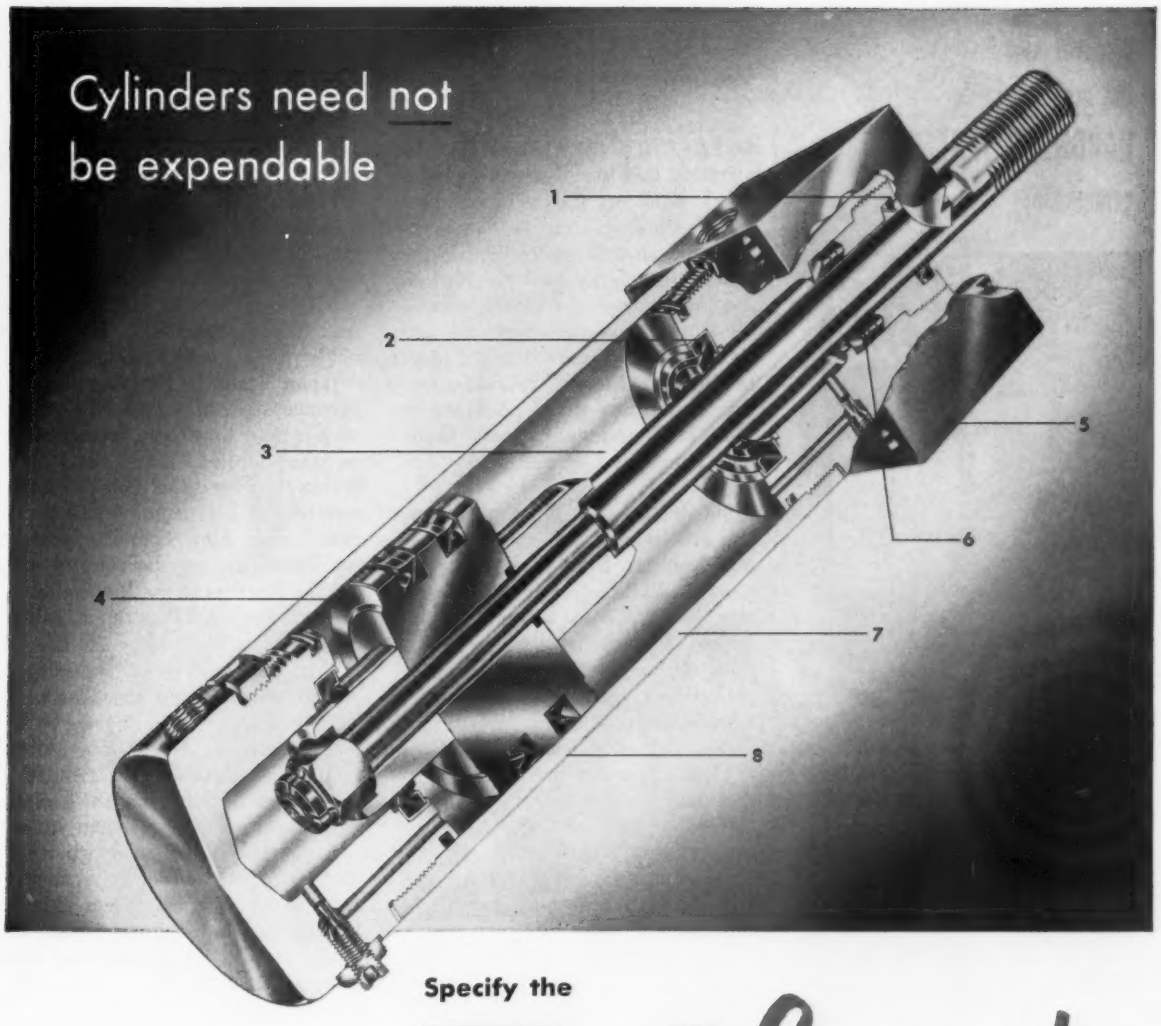

With Extras . . . At No Extra Cost

1. METAL PISTON ROD SCRAPER—protects rod packing, cylinder bore and rod surface by removing all foreign particles.
2. NEW "SUPER" CUSHION for air or METALLIC SELF-ALIGNING MASTER CUSHION for oil.
3. HARD CHROME PLATED CYLINDER BORES AND PISTON RODS for greater protection and reduced wear.
4. ONE PIECE PISTON assures better alignment, longer bearing and packing life.
5. FORGED SOLID STEEL HEADS throughout entire line.
6. PILOTED PACKING GLAND with extra long bearing for additional strength and support to piston rod.
7. NO TIE-RODS TO STRETCH—gives you 360° port rotation . . . less space used . . . full strength.
8. STREAMLINED DESIGN . . . operating pressures to 200 PSI, air; 1,000 PSI oil, non-shock.

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T-J Spacemaker

for longer, more efficient cylinder service

You too—can reduce replacement expenditures—lower maintenance costs with the T-J Spacemaker cylinder line. Designed and engineered for ruggedness, and accuracy of operation, the Spacemaker assures longer, uninterrupted operation.

The T-J Spacemaker eliminates tie-rods, gives greater strength, saves space . . . and reduces costs in all push-pull operations. Immediate delivery in a complete range of styles and capacities . . . air or oil. Write for Bulletin SM 155-4, today. The Tomkins-Johnson Company, Jackson, Michigan.

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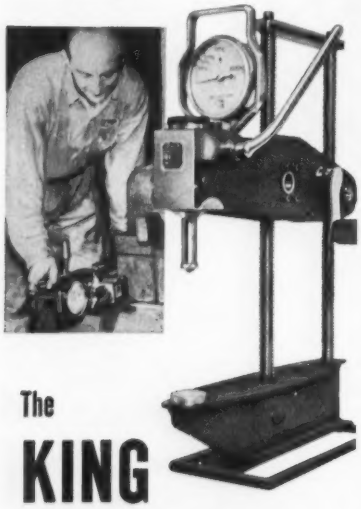

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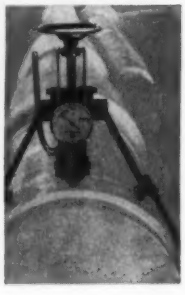
tests!



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Uses loads from 62½ Kg. to 3000 Kg.

Keep it in the plant or take it out in the field — can be used in any position anywhere. It's rugged, lightweight and fast!

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Certain areas open for representatives

Circle 561 on Page 53

With the Editors

● **EXPANDING MARKETS:** In planning this issue—which includes information on the technical program and other activities connected with the annual convention of the American Foundrymen's Society and the 2nd Engineered Castings Show—the editors decided to present a special study on "Expanding the Markets for Cast Metals." It is an extension of our first study, presented in May, 1957, under the general heading "Foundries Can Sell More Castings."

Starting on page 100 of this issue, five articles approach some marketing problems from interesting angles. In "Marketing Is Only Common Sense," George K. Dreher, marketing director, Steel Founders' Society of America, covers in considerable detail the basic concepts of a marketing program. In "Managing a Foundry Professionally," Glenn J. Cook, manager, marketing, General Electric Foundry Department, Schenectady, N. Y., tells how the management of a foundry can improve its operation by investing time and effort in becoming students of the business.

The third article of this report, "Good Casting Design Means More Sales," was prepared by Donald F. Richter, superintendent of Experimental and Development Department and John L. Flitz, products development engineer, Central Foundry Div., General Motors Corp., Saginaw, Mich., as a part of that organization's series of successful Casting Design Conferences. It explains how design improvement produces better castings at reduced costs, and how radiography assists in developing procedures to produce better castings.

The next portion of the special report is a staff-written article, "Casting Conferences—A Marketing Tool." Much of the information was provided by a number of foundries which have had outstanding success in that field. To those contributing may we extend our sincere thanks.

The last article, "How To Achieve Profitable Growth," was prepared by Gregory M. Boni, senior partner, Touche, Niven, Bailey & Smart, New York, and presents the factors needed for proper forecasting.

Foundries both individually and in groups are giving greater attention to building markets than at any previous time. Therefore, the editors believe you will find this special study valuable.

—o—

Japan Again: In February this department told of a visit of a group of Japanese gray iron foundrymen to the United States and the FOUNDRY office. On Feb. 4, eight members of a Japanese Small Business Copper Alloy Foundry Specialists Team, touring the country under the auspices of the International Co-Operation Administration, called at the Penton Building in Cleveland to visit with FOUNDRY editors.

This team also presented us with a beautifully prepared 32-page booklet, this one entitled "Copper Alloy Foundry in Japan—1959." Statistics in this booklet show that the greater part of copper alloy castings in Japan is manufactured by small or medium-sized foundries, ranging from 5 to 300 employees. Many small foundries have fewer than five employees. Fluctuating prices of raw materials provide the latest difficulty among these foundries.

Brass and bronze casting in Japan dates back to the 7th and 8th centuries. A gold-plated bronze Buddha erected in 749, for example, is 54 ft high and weighs 995,900 lb. The lost wax process is believed to have been used to produce castings made as early as 708. Today, the industry's problem is productivity.

—o—

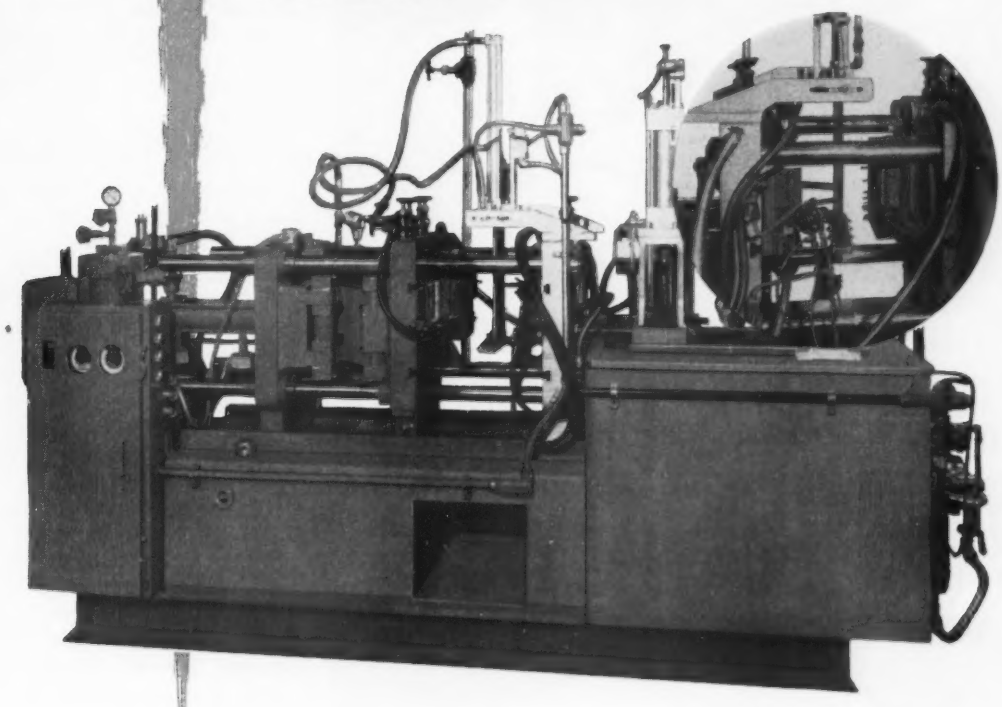
Thank You, Dean: All of those who hold membership in the Foundry Educational Foundation, or who have contributed to its progress, should be gratified with the comment of Dean Kurt F. Wendt, University of Wisconsin, in his opening address at the recent Wisconsin Regional Foundry Conference in Milwaukee:

"Through the Foundry Educational Foundation the foundry industry has been supporting a vital program which is paying large dividends. At the University of Wisconsin alone, the Foundation has

CAST-MASTER MODEL NO.B-7-Z

COMPLETELY AUTOMATIC

DIE CASTING MACHINE



Successful Automatic Die Casting is Now a Reality!

The Cast-Master B-7-Z Automatic Zinc Die Casting Machine is proving itself daily, in plants throughout the country. Users report increased production, at tremendous savings in time and expense. *The B-7-Z automatically oils and cleans die surfaces, eliminating lost cycles . . . automatically ejects "hung-up" parts . . . automatically signals when the machine needs attention. Safety is greatly increased through a new low-pressure closing system.* Learn what automatic die casting can mean to *your* production. See a demonstration at our plant, or contact your local representative, who will show you movies, in your plant, of the machine in operation.

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- **Midwest Rep.** C. W. Stone Co., Minneapolis, Minnesota
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- trouble-free tilt . . . *holds* in any position
- heavy duty cast iron trunnions surrounded by roller bearings
- precision-machined throughout
- arrives factory-assembled, factory-tested to operating temperature
- exclusive Hausfeld swing-top compensates for various size top covers

With crucible sizes from #40 to #400, there is a Hausfeld Tilting Furnace to help you boost your plant's efficiency. Write for full details today.

THE CAMPBELL-HAUSFELD CO.,
300 Moore St., Harrison, Ohio

CAMPBELL-HAUSFELD
METAL MELTING FURNACES

since 1947 made available some 168 scholarships involving 108 different young men, with an investment of $66,850. I said investment, rather than cost, because I firmly believe that this project has created a greater interest in the foundry field among young engineers, and has resulted in more highly trained men entering the field than any one other single factor."

—o—

Research Up: Late last year, the American Management Association announced that an earlier study of 800 companies in all parts of the country showed 1958 budgeted expenditures for research and development were up an average of 4 per cent over 1957. A later sampling of about 15 per cent of that group revealed plans for increasing research budgets upwards of 6 per cent in 1959 over 1958.

I wonder how the foundry industry would stack up in such a study.

—o—

Really Busy: Our retired foundrymen surely keep busy. Since we needed a photograph of James R. Allan, retired manager, Industrial Engineering & Construction Dept., International Harvester Co., Chicago, for the AFS awards story (page 137) I addressed a request to Jim's Florida home. His kind reply indicated he is president, Allan Industries Inc., Melbourne, Fla., an engineering organization, chairman of the Planning Committee for a new hospital, and president of the newly organized Chamber of Commerce, to name only a few of his activities.

This is what you might call "really busy."

—o—

See You There: Both the editorial and business staffs of FOUNDRY will be in Chicago April 13-17 to attend the various technical sessions and meetings of the AFS and to view the Engineered Castings Show. A complete report of activities will be prepared by the editors for presentation in the May and June issues of FOUNDRY. In between these duties, Bill Gude, Ed Bremer, Bob Herrmann, Jack Miske, and Frank Steinebach hope to visit a bit with you.

But if you cannot make it to Chicago, watch for the complete reports in the May and June issues.

F.G.S.

Circle 563 on Page 53

BASIC REASON

FOR BIG SAVINGS IN 270 FOUNDRIES

KOLD-SETTING Binder will produce optimum results when the installation is engineered by a qualified specialist. That is why we maintain "in-plant" service.

There are now 270 foundries using KOLD-SET to produce better castings at lower costs. The average reported savings is in excess of 40%. Each of these foundries was "started up" with the aid of one of our KOLD-SET engineers. Equipment was studied and evaluated—then, recommendations were made on how KOLD-SET could be adapted to produce best results. The KOLD-SET man stayed with the installation during the early stages and remains on call if further services are required. Periodic service calls further assure our customers of maintaining production.

If you are wondering how KOLD-SETTING Binder will work—a KOLD-SET man will be glad to study your processing and offer recommendations without obligation.

Write or phone!

KOLD-SET®

THE ORIGINAL COLD SETTING BINDER

G. E. SMITH, INC.

246 Washington Road Pittsburgh 16, Pa.

Warehouse Stocks in Chicago, Boston, Detroit, Philadelphia

Kold-Set is Patented in the United States

new

KOLD-SET

ZIRCON WASH

Produces Better Castings because:

1. Controlled viscosity
2. Deep Penetration
3. Uniform Film Thickness

Write for bulletin.

Circle 564 on Page 53

Hansberg Shooters and »Komax« Gassers for CO_2-Cores and Molds

① Röperwerk »Hansberg« Core and Mold Shooter with built-in »Komax« CO_2-Gasser, total cycle 15-20 seconds.

② Röperwerk Three-Station Turntable Coreshooter-shoots, gasses and strips on single unit-perfect for high-production CO_2 cores up to 8½ lbs, cycle 5-8 seconds.

③ Röperwerk »Komax« CO_2-Gasser

④ Röperwerk CO_2-Timing Apparatus

HANSBERG SHOOTERS, INCORPORATED

P. O. BOX 729 · EVANSTON · ILLINOIS · USA

Hansberg Shooters, Röperwerk Komax CO_2-Gassers and other Foundry Equipment

HANSBERG

SHOOTERS

have revolutionized CORE-MAKING in the foundries of the WORLD. HANSBERG SHOOTERS outsell all other CORE-MAKING machines in industrial EUROPE and are rapidly being accepted in America.

FULLY AUTOMATIC
Hansberg Shooter Model H-12A

Read this report taken from the AMERICAN FOUNDRYMEN'S SOCIETY, "Transactions" Vol. 64, Page 585.

"CORE BLOWING"

"Our present core-blowers propel, or blast the sand into the box. Satisfactory results can be obtained when each grain of sand is completely surrounded by air. A close examination of this principle concludes that it is similar to sand-blasting. The core boxes are consequently subjected to severe wear. The very nature of this operation dictates the use of an abrasive-resistant core box, costly to build and costly to maintain."

"CORE SHOOTING":

"To minimize this condition, new principles of coreblowing are being developed. The shooting principle recently introduced in Europe may be an answer. This operation uses only a small, measured amount of compressed air in the sand magazine. Due to the large-size blow valve the air is supplied instantaneously and the sand is extruded into the box. In other words, the sand is sufficiently accelerated in a body so that it fills the box completely and uniformly. Theoretically, this should result in even strength values throughout the core and render uniform permeability."

***With* HANSBERG SHOOTERS**

YOU CAN **SAVE ON INITIAL COST • SAVE ON SET-UP TIME • SAVE ON CORE BOX WEAR • SAVE ON MAINTENANCE • SAVE ON COMPRESSED AIR**

SEND for "FACTS about HANSBERG SHOOTERS." The difference between core blowing and core shooting, why the SHOOTER is a "MUST" for the CO2-Process, etc.

HANSBERG SHOOTERS

offer the largest selection of Core-Making machines, CO2-Gassers and combinations of Shooters and CO2-Hardening machines. Choose from 22 models. Write about our newest 1959 models.

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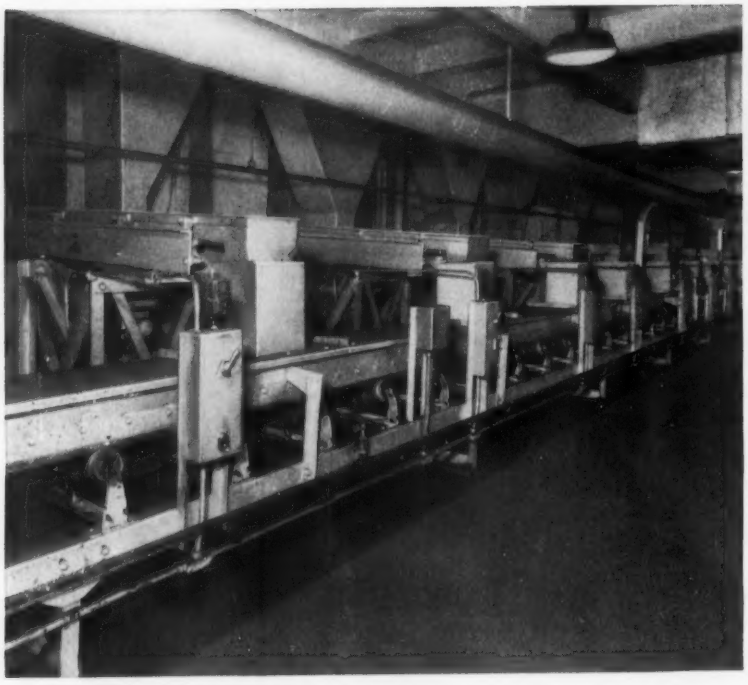
Circle 566 on Page 53



Battery of AJAX VIBRATING FEEDERS conveying spill sand from mold stations to main conveyor carrying sand to point of reuse in one of America's most modern high production automotive foundries.

ANNOUNCING AJAX Vibration Engineering Service

To help You Shake Down Your Costs of Feeding, Conditioning, Separating and Conveying Sand

AJAX VIBRATION ENGINEERING offers a wealth of experience in putting vibration to work for the Who's Who of industry. You don't have to be BIG to cut your costs and improve your competitive position by taking advantage of its savings.

AJAX LO-VEYORS **Separate, Sort, Align, Process, Wash, Cool Dry, Clean, and Salvage as they Convey**

Learn how AJAX VIBRATION ENGINEERING makes it possible for one multi-purpose Lo-Veyor to perform several operations at the cost of a single machine. Phone or Write outlining your requirements and ask for this New Ajax Selection Guide which shows how vibration will shake down your costs.

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204 Portage Road, Westfield, N. Y.

Please send Ajax Lo-Veyor Selection Guide to

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Concern_____

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CALENDAR of Meetings

April 8-9—Malleable Founders' Society, Market Development Conference, Wade Park Manor, Cleveland.

April 13-17—AFS Castings Congress & Engineered Castings Show, Hotels Sherman and Morrison, Chicago.

April 16—Foundry Section, Magnesium Association, sectional meeting, Congress Hotel, Chicago.

May 13-15—National Industrial Sand Association, annual meeting, Homestead, Hot Springs, Va.

May 14-16—American Institute of Industrial Engineers, annual national conference and convention, Biltmore Hotel, Atlanta.

May 20-22—Society for Experimental Stress Analysis, national spring meeting and exhibition, Sheraton Park Hotel, Washington.

May 25-26—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

May 25-27—American Society for Quality Control, annual convention, Public Hall, Cleveland.

May 25-28—Design Engineering Show, sponsored by machine design division, American Society of Mechanical Engineers, Convention Hall, Philadelphia.

June 9-12—Material Handling Institute, 1959 Exposition, Public Hall, Cleveland.

June 21-26—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 22-26—Air Pollution Control Association, annual meeting, Statler Hilton Hotel, Los Angeles.

June 25-27—Penn State Foundry Conference, Pennsylvania State University, University Park, Pa.

Sept. 21-22—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 21-25—Instrument Society of America, annual Instrument-Automation Conference and Exhibit, International Amphitheatre, Chicago.

Sept. 24-25—Missouri Valley Regional Foundry Conference, Missouri School of Mines & Metallurgy, Rolla, Mo.

Oct. 4-10 — International Foundry Congress, organized by Spanish Institute of Iron & Steel, Madrid, Spain.

Oct. 7-9—Gray Iron Founders' Society, annual meeting, Fairmont Hotel, San Francisco.

Oct. 8-9—Michigan Regional Foundry Conference, Pantlind Hotel, Grand Rapids, Mich.

Oct. 10-13 — Conveyor Equipment Manufacturers Association, annual meeting, Grand Hotel, Point Clear, Ala.

Oct. 11-16—American Society for Testing Materials, Pacific area national meeting, Sheraton-Palace Hotel, San Francisco.

Oct. 15-17—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 22-23—Ohio Regional Foundry Conference, Deshler-Hilton Hotel, Columbus, Ohio.

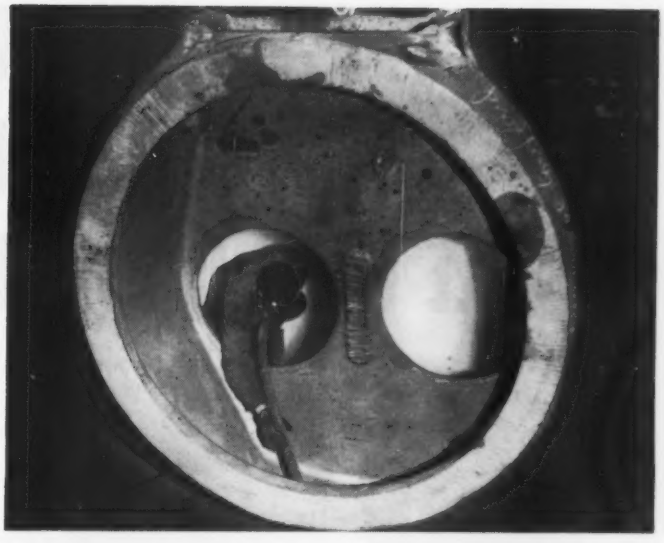
Nov. 5-6—National Foundry Association, 61st annual meeting, Roosevelt Hotel, New York.

Nov. 16-20—International Automation Congress & Exposition, New York Trade Show Building, New York.

Dec. 2—Electric Overhead Crane Institute, annual meeting, Carlton House, Pittsburgh.

Circle 567 on Page 53

Portable Conveying Systems Trim Foundry Costs



Profits Up—Costs Down

In today's modern foundry, material handling, the production cleaning of molds and castings, plus related expenses are frequently an appreciable percentage of production costs—in some cases running as high as 25 to 30%. Therefore, even a 10% reduction in handling costs will provide the equivalent of a substantial increase in sales.

Eliminates Manual Handling

Executives seeking methods to cut down on production and maintenance costs can find a relatively inexpensive solution to their handling problems in the new *Award Winning* Hoffco-Veyor portable conveying units. These versatile units have trimmed costs in the foundry, brick, chemical and other manufacturing industries. Many pick up and disposal functions formerly handled manually are now the responsibility of Hoffco-Veyors. From either a fixed location or at various points in the plant, the one-man operated Hoffco-Veyor keeps materials moving rapidly to provide substantial time, labor and product savings.

Industrial "Work Horses"

Veritable "work horses," Hoffco-Veyors handle a wide range of rugged duty jobs such as conveying shot blast, gritty substances, sand, etc. Meeting the toughest foundry demands, they recover spent shot, clean molds, pick up spilled materials and empty drums among other tasks. In their flexible handling of all types of heavy duty chores, they offer these advantages:

- Rapid pneumatic loading and unloading of hoppers and containers.
- Higher production levels through reduced downtime.
- Easy maneuverability in crowded or virtually inaccessible areas.
- Can be hooked up to stationary piping for reaching remote areas.
- Streamlined design and compact construction assures years of dependable operation – minimum maintenance costs.
- Simple adaptor cover permits use of standard 55 gallon drums as auxiliary collectors.
- No dangerous moving parts.
- Low in first costs.
- Flexible enough for use as a vacuum cleaner – unit equipped with inlet valve to take standard size 1½ to 2 inch vacuum hose for ordinary cleaning operations when not in use as a conveyor.

Efficient, Inexpensive Vacuum Cleaning

As a vacuum cleaner, the Hoffco-Veyor can be used for general foundry cleaning. In contrast to expensive compressed air which defeats the purpose of good housekeeping by blowing dust and dirt about, Hoffco-Veyors vacuum clean and remove dust and dirt from equipment, walls and floors. Vacuum cleaning of molds and cores greatly reduces the occurrence of sand inclusions in casting surfaces. Substantial savings also accrue from improved product finish together with a reduction in welding and other operations in casting cleaning rooms. Moreover, healthier working conditions increase plant efficiency.

Savings In Your Foundry

If your foundry is using a non-automatic method of handling and cleaning, the Hoffco-Veyor can help you obtain higher profits today and in the years to come. Send for the free booklets describing how portable Hoffco-Veyors and stationary systems will cut operating and maintenance costs in your foundry—pay for themselves in materials savings alone. Mail coupon today.

Kindly send the following FREE booklets.

☐ PB 502. How a Portable Hoffco-Veyor Trims Foundry Operating Costs.

☐ AB-100. How Stationary Vacuum Systems cut costs, increase efficiency.

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Circle 568 on Page 53

CHATEAUGAY PIG IRON PROVES IDEAL BASE METAL FOR DUCTILE IRON DIESEL ENGINE PISTONS

Ductile iron diesel engine piston cast with Chateaugay Pig Iron by Hunt-Spiller Manufacturing Corporation, Boston, Massachusetts, is type 100-75-04 designating 100,000 psi minimum tensile strength, 75,000 psi minimum yield strength, and 4% minimum elongation.

Cutaway offers proof of fine uniform grain structure. The use of Chateaugay as the base metal for ductile iron results in economical machining, plus superior finish, tensile strength, yield strength, and elongation characteristics.

Mechanical strength, wear-resistance, heat-resistance, and minimum weight are the four primary factors influencing diesel engine piston design.

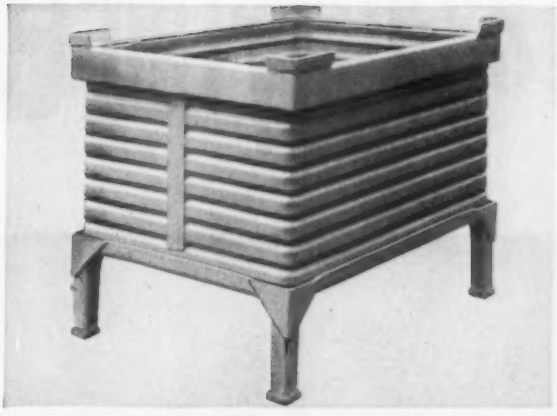
A fifth factor is cost. The piston must be designed so that it can be manufactured and sold at a reasonable price. It must be easy to cast and to machine.

Using Republic Chateaugay Pig Iron as the base metal, Hunt-Spiller Manufacturing Corporation has successfully met all of these requirements in developing ductile iron pistons as a replacement for aluminum. Tests, conducted under particularly severe service conditions by several major railroads, show the ductile iron pistons to have nearly double the service life of aluminum.

Chateaugay is perfectly suited for ductile iron use because of its high total carbon and unusually low phosphorus, silicon, and manganese content. Consistently uniform distribution of chemical elements in Chateaugay assists in producing a dense grain structure which results in excellent wear-resistance and economical machining.

The inherently excellent physical properties of Chateaugay are maintained in the ductile form assuring Hunt-Spiller of consistent benefits through its ability to fill adjoining light and heavy sections completely. This assures strong, flaw-free castings accurate to patterns and shapes.

Other superior characteristics of Chateaugay make it ideal for a wide variety of casting applications. A Republic Pig Iron Metallurgist will be happy to discuss these possibilities with you. There is no cost, no obligation for his services. Simply contact your Republic representative, or mail the coupon.



REPUBLIC HIGH STRENGTH STEEL BOXES offer the perfect solution to handling hot work in foundries. Designed to withstand plenty of use and abuse. Corrugated steel construction of sides and bottom assure long service life. Stacking brackets are securely welded to top corners of each box, permitting tiering to any practical height. Sixteen-inch clearance is provided for easy handling by fork lift truck. Boxes measure 53″ long by 38″ wide x 26″ deep. Send coupon for full facts.

REPUBLIC METALLURGICAL SERVICE provides a solid foundation for industry's most complete line of merchant pig iron. Republic offers expert metallurgical service to assist you in selection, application, and processing. The Republic Pig Iron Metallurgists are both foundrymen and skilled technicians. They have at their fingertips information on the latest processes and techniques available for improving castings, and expanding their use and sale. Mail the coupon for this obligation-free service.

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World's Widest Range of Standard Steels and Steel Products

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Send more information on:
☐ Chateaugay Pig Iron ☐ High Strength Boxes

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Company_____
Address_____
City_____ Zone____ State_____

Circle 569 on Page 53

Only CarVer offers

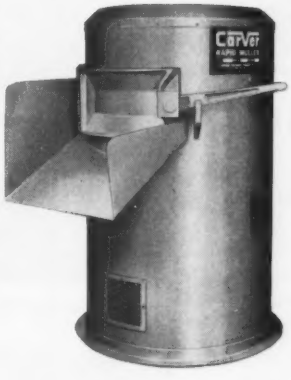
CARVER V & S CORE SHOOTER

No other core shooter (or blower) can give you the speed, versatility, economy and efficiency of the Carver V & S Core Shooter. *Lightning-fast change-over* for short-run jobs! *Harder ram* turns out high stand-up cores from stiffest sand! *4 times* more economical on air! 100% pneumatic. Few parts to ever need repair. Compare — and you'll choose the Carver V & S Core Shooter!

everything for the CO_2 PROCESS!

CARVER RAPID MULLER

Specially designed and patented mixing arm turns out a full batch every 75 seconds . . . without generating excessive friction heat. You *save up to 30%* in binder! No wheels or paddles to interfere with cleaning. Takes up as little as 7 sq. ft. of floor space. Fast — efficient — compact! Batch sizes up to 1200 lbs.



KRAUS Tapered Slot Self-Cleaning Core Vents

Provide complete de-aeriation of core box *without clogging*. Quickly and easily installed in either wood or metal boxes. Precision manufactured of solid bronze to leave no mark on core. Knurled on side to grip wood boxes better. Comes in sizes to meet the specific job requirements.

STEINEX — The Original CO_2 Binder

The *best* binder at the *lowest price* — BY FAR! And you get the best shakeout, with scrap held to the absolute minimum. Faster chemical reaction to CO_2 saves time and gas. Insist upon STEINEX —the original CO_2 binder available only from Carver! WHY PAY MORE??

CARVER AUTOMATIC GASSING APPARATUS

Fully automatic! Hardens cores completely through in a few seconds and at a fantastic savings in CO_2 gas! Easily adjusted to core boxes of almost every shape and size. Pneumatic operation requires little air to operate. Savings in initial cost and operating expense is far less than that of drying ovens for oil cores.

. . . and you get CARVER service — a BIG PLUS VALUE!

Carver has the experience and in-the-foundry know-how that will show you and help you get the most from your CO_2 equipment and the CO_2 process!

Carver
FOUNDRY PRODUCTS CO.
MUSCATINE, IOWA

Circle 570 on Page 53

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO., Muscatine, Iowa

Please send complete information on:

- ☐ CARVER V & S CORE SHOOTER
- ☐ CARVER RAPID MULLER
- ☐ KRAUSS Tapered Slot CORE VENTS
- ☐ STEINEX
- ☐ AUTOMATIC GASSING APPARATUS

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CITY STATE

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COLEMAN OVENS

reduce waste . . . lower costs

in every type of foundry

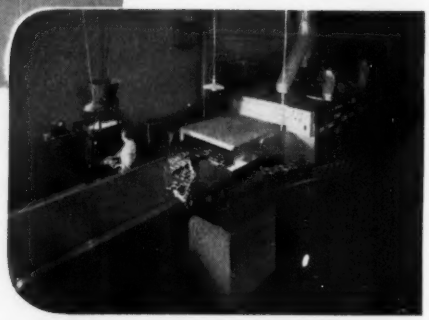
You can reduce casting scrap . . . CUT YOUR LABOR, MATERIAL AND FUEL COSTS by baking cores and drying molds in Coleman Ovens. Small and large foundries alike find that Coleman Ovens are vital to better quality castings and increased profits.

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

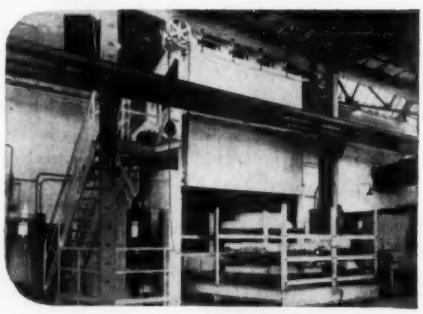
Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work—grey iron, malleable, steel, alloy, brass, aluminum and magnesium.

Profit by this experience — let us recommend, at no obligation, the Coleman Oven for your needs.

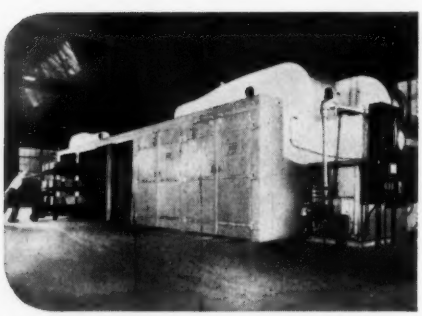
Write for Bulletin 54



Coleman Dielectric Core Oven



Coleman Car-Type Oven



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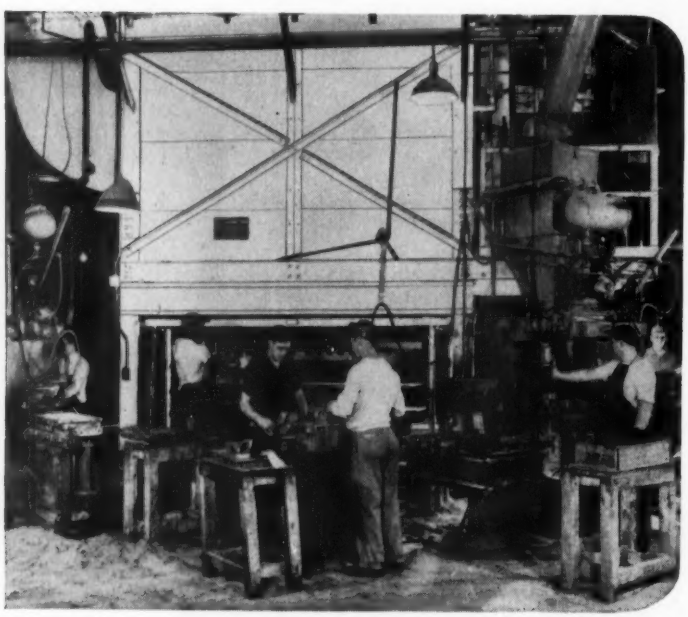

Coleman Tower® Oven

A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

Circle 571 on Page 53

BOOKS
FOR FOUNDRYMEN

Our Book Department carries a wide variety of books of particular interest to foundrymen. Here are some titles presently available. If you are seeking a title not listed, write us—we'll be glad to get it for you.

PRINCIPLES OF METAL CASTING

By Richard Heine and Philip Rosenthal. Covers every step of standard foundry processes . . . explains what equipment is used for each phase, when and how it is used . . . and describes proven procedures that make for greater economy in metal casting. Crammed with photographs and illustrations. —$7.50

STEEL FOUNDRY PRACTICE

By John Howe Hall. A comprehensive sourcebook covering all phases of modern steel foundry practice. Contains practical information on almost every production problem steel foundrymen encounter. —$12.00

THE CUPOLA AND ITS OPERATION

Latest developments, such as hot blast, basic lining for nodular iron, and emission control are covered. Chapters such as those on refractories, principles of combustion, and metallurgy have been greatly augmented or are presented for the first time. More than 50 of the country's outstanding foundrymen have contributed their knowledge and experience to this book. —$9.50

CAST METALS HANDBOOK, 4TH EDITION

Every modern thinking product designer needs this handbook. Contains reliable working data for utilizing the properties of cast metals to the greatest engineering advantages—unbiased and substantiated information on new, reliable developments in cast materials—practical, up-to-date facts on HOW to get the most out of castings designs. —$10.00

BRASS AND BRONZE FOUNDRY PRACTICE

By Harry M. St. John

Now brass founders have available a comprehensive modern treatment of all aspects of brass foundry theory and practice in one source.

It covers the entire range of brass foundry operations and its 23 chapters discuss alloys, technical and operating procedure, quality control, testing, brass foundry economics, cost control, casting design, patternmaking, foundry layout, and salvage of waste material. The text is supplemented by 85 illustrations which clarify and enlarge on the subject matter.

250 pages, 85 illustrations
6 x 9, cloth bound
Price $8.00

FUNDAMENTALS IN THE PRODUCTION AND DESIGN OF CASTINGS

By C. T. Marek. Stresses the fact that economy of production is a basic requisite of good casting design. Techniques, skills and practices in casting production are developed to support the principal objective—correlating casting design with economical production. —$5.25

NONFERROUS FOUNDRY METALLURGY

By A. J. Murphy. Covers general principles unifying foundry techniques of all industrial nonferrous metals in relation to metals in the liquid state, to the process of solidification and to the factors influencing properties of casting. 497 pages. —$12.50

METALLURGY OF STEEL CASTINGS

By Charles W. Briggs. A comprehensive work. Provides complete information on methods of technical and industrial control in production of steel castings and describes every manufacturing process used. —$11.00

FOUNDRY CORE PRACTICE

Over 100 leading authorities on foundry problems collaborated with the author, Harry W. Dietert, to pool their knowledge in making this the type of book that is of maximum benefit to the foundry field. —$10.00

METALLURGY FOR ENGINEERS

By J. Wulff, H. F. Taylor and A. J. Shaler. This book is written from the metallurgical rather than the shop point of view and aims to give the reader "an adequate understanding of metals so that he may intelligently select and use them." 624 pages, 290 illus. —$7.25

BASIC COST PRINCIPLES FOR NONFERROUS FOUNDRIES

An up-to-the-minute guide for costing in both small and large foundries. Prepared by practical foundrymen, book is based on 10 years' research and experience under Government pricing regulations. —$5.00

FOUNDRY, BOOK DEPT., 1213 W. 3rd St., Cleveland 13, Ohio

Please send (postpaid) the following books I have checked:

- ☐ Principles of Metal Castings
- ☐ Brass and Bronze Foundry Practice
- ☐ Cupola and Its Operation
- ☐ Cast Metals Handbook
- ☐ Fundamentals in the Production and Design of Castings
- ☐ Nonferrous Foundry Metallurgy
- ☐ Metallurgy of Steel Castings
- ☐ Steel Foundry Practice
- ☐ Foundry Core Practice
- ☐ Basic Cost Principles for Nonferrous Foundries
- ☐ Metallurgy For Engineers

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CITY AND STATE _____

Enclosed is $_____. ☐ Company Order ☐ Money Order ☐ Check

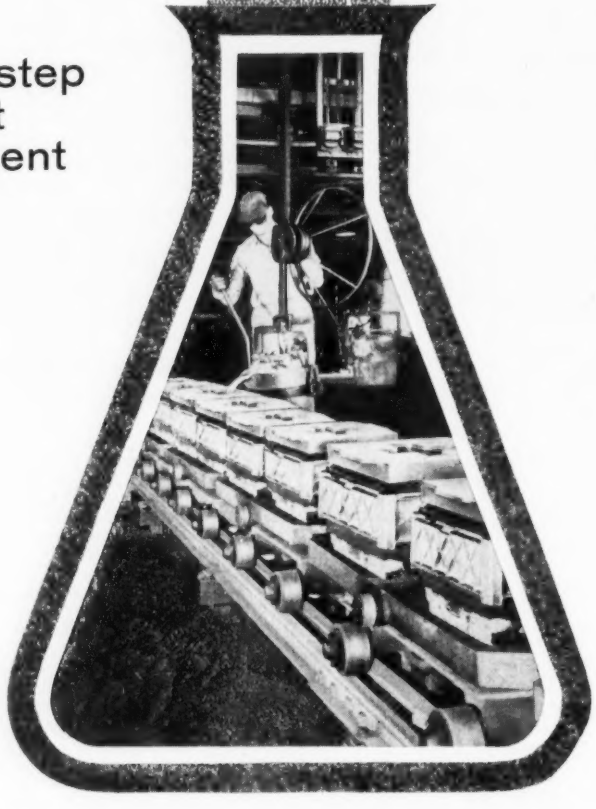
Orders for delivery in Ohio—add 3% to cover state sales tax.

Mechanize step by step with Link-Belt equipment

LINK-BELT'S "prescription" for a *more profitable* foundry is easy to take. With this step-by-step plan, you start by mechanizing where you need it most . . . then add equipment piece by piece according to a well-organized plan.

With industry's broadest line of conveyors and preparation equipment—plus know-how developed through 50 years of serving foundries—Link-Belt can match every need of your step-by-step improvement program. And, single components or complete system—you can be sure all are designed to save time, minimize hazards to health and safety, increase productivity with less cost.

Step-by-step mechanization requires long-range planning to achieve a systematic arrangement of equipment. That's where Link-Belt's vast experience pays off. Our specialists will put this experience to work for you . . . will help you set the modernization pace that suits you best. For details, call your nearest Link-Belt office or write for Book 2423.



LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,104

FOUNDRY COLOR-SOUND FILM AVAILABLE! Thirty-minute film, "Foundry Flexibility," shows benefits of *complete* mechanization. It will be lent on request for viewing by your group. *WRITE LINK-BELT EXECUTIVE OFFICES TODAY.*

MEMBER FEMA

Research scientists using X-Ray Diffractometer to investigate structure of an aluminum alloy . . . Aluminium Limited's laboratories, Kingston, Ontario.

To aluminum fabricators...

who see new opportunities in every research success!

TODAY, in the research laboratories of the industry there's much in progress. New applications and alloys . . . improved finishes . . . more efficient fabricating practices—all are recent accomplishments aimed at delivering to the user a better aluminum product at minimum cost.

A leading North American aluminum producer, Aluminium Limited maintains research and development facilities that are among the finest in the industry. In four laboratories—located to draw on world-wide scientific knowledge—teams of metallurgists, physicists, chemists and engineers are mastering problems that run from the "blue sky" to the very practical—wherever research can be most profitable to the aluminum industry, and particularly to our good customers, leading independent fabricators in the U.S.

For information on how we can serve your ingot and alloy requirements, call or write the nearest office of Aluminium Limited Sales, Inc.

Aluminium
Limited

Ingot Specialist...serving
American Aluminum Fabricators—

In the U.S.—Aluminium Limited Sales, Inc., 630 Fifth Ave., New York 20, N. Y.
CLEVELAND • CHICAGO • LOS ANGELES • DETROIT • ATLANTA

Additional distribution (Alcan Foundry Alloys): **Apex Smelting Co.**, Chicago, Cleveland, Los Angeles • **Charles Batchelder Co., Inc.**, Botsford, Conn.

Circle 574 on Page 53

Harry Demerjian increased

Harry Demerjian has more than 25 years experience as an abrasive specialist. After a war-time career in the U. S. Army Signal Corps, he set up his own business, Abrasive Sales Co., in New York City and he's been a highly successful Bay State representative ever since.

cut-off production 50% at Frank Roth Co.

They had a right to be skeptical at the Frank Roth Foundry in New York City, when they first saw Bay State's BZ2AA cut-off wheel. A wheel that's only 1/8" thick looks pretty thin when you've been using a conventional 16" x 5/32" x 1" cut-off. When you start thinking about possible warpage and flutter, not to mention *shattering*, it's enough to give you nightmares.

BUT... Bay State distributor Harry Demerjian put on a demonstration that convinced operators, foremen and management, too, that the BZ2AA was one of the safest cut-off wheels ever made. On top of this, it cut straight and true without a sign of flutter... and it cut faster, lasted longer and saved material because its thin edge ground away 20% less metal. Cutting investment castings of extremely hard and expensive materials, the BZ2AA increased production a full 50% and made substantial savings by increasing scrap salvage, too.

Like Harry Demerjian, your own Bay State representative is an experienced abrasive specialist as well as a good salesman. *Better grinding at lower cost... that is his business.*

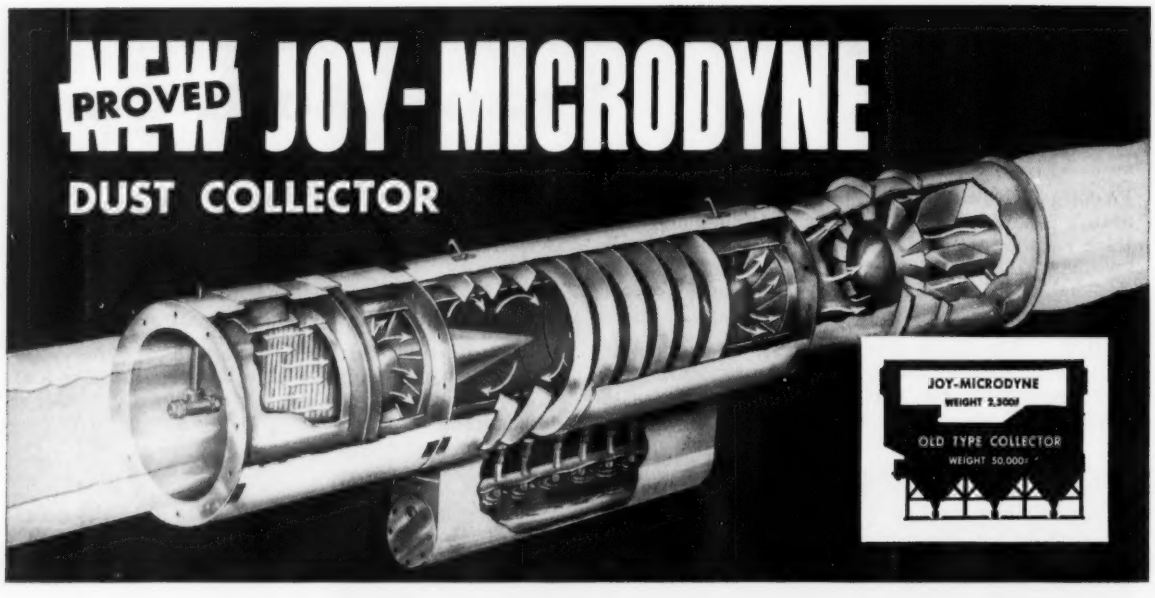
Foundry Foreman Henry Koster cuts gates off extremely hard cobalt-chromium-tungsten swaging die castings... a job that goes 50% faster with Bay State's BZ2AA than it did with the previous wheel.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles. *Distributors:* All principal cities.

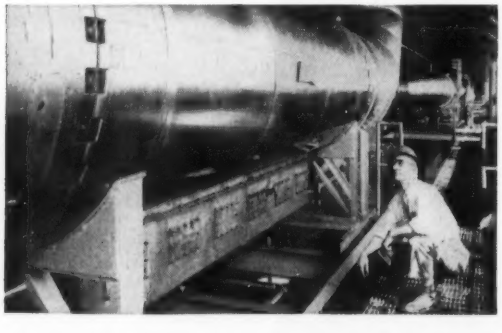
Circle 575 on Page 53



Profile of a Problem Solver

Here is an in-duct "educated pipe" that laughs at space, weight and water limitations as it collects over 99% of dust 5 microns and larger; 92% of 2-micron dust, and substantial amounts of smaller dust.

Particles enter through water-saturated air, slam against a water-film-covered impingement element, encase themselves in water droplets as they pass through, then whirl and collect on the sides of the middle section, to finally drain into a sump. Cleaned air is straightened and thrust on its way by an integral Joy Axivane Fan.



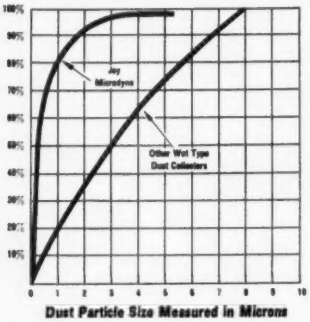
This 48,000 cfm installation shows compact assembly and space economy of in-duct placement.

SAVES SPACE—Installs as an integral section of ductwork; requires only 1/10 to 1/20 the space of conventional units. 2500 cfm unit is 10 feet long; 1.5 feet in diameter.

SAVES WEIGHT—Even the largest unit—64,000 cfm, 5 feet in diameter, 32 feet long—weighs only 6,500 pounds . . . or 1/5 the weight of conventional collectors. 2,500 cfm unit weighs only 325 pounds.

SAVES WATER—The largest Joy collector requires only 48 GPM flow—much less than comparable wet collectors. Add a Delpark Filter (Sold by Joy) and water can be recirculated to recover valuable dusts. The filter also reduces water borne solids to give a dependable, clear water supply from a dirty water source.

SUCCESSFUL INSTALLATIONS—Joy collectors from 500 cfm through 64,000 cfm are *now in use* collecting such widely varied dusts as hemitite, copper and uranium ores, coal, quartz, limestone, phosphate, stainless steel and titanium carbide grindings. For answer to your dust collecting problems, write, wire or call: ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** *In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

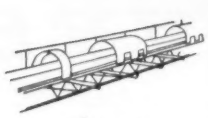


Performance graph of actual installation shows efficiency of the Joy-Microdyne Dust Collector. (A micron is 1/25,000 inch)

WSW I 7002-231

WRITE FOR FREE BULLETIN 231-13

JOY . . . EQUIPMENT FOR INDUSTRIAL PLANTS . . . FOR ALL INDUSTRY



Conveyors

Industrial Compressors

Electrical Connectors

Fans and Blowers

Circle 576 on Page 53

People are talking about

Borden 7 NEW BINDERS & RESINS

that help solve
core and shell mold problems!

FB26

"Licks the odor problem!"

Odor-free, high-strength urea resin in liquid form. Cures fast. Use for dielectric and conventional baking.

FB113

"Dries cores faster!"

This phenolic resin powder is designed for fast dielectric and conventional baking.

ML-7

"Makes sand mixing easier!"

Resin in alcohol solution. For warm coating shell mold sands for fast mull-out.

ML-9

"Coats sand safely with liquid!"

Single-stage sand coating resin in liquid form for safe, simplified mixing. For warm coating and fast mull-out.

TP27

"Bonds shell molds quickly, securely!"

Assemble shell molds and cores easily and securely with this fast, permanent bonding resin powder. Soluble in alcohol.

MCF-280

"Cuts shell mold cure time by 24%!"

A fast curing powder for shell molds, cores and for coating sand by warm or cold solvent process.

TP200

"A non-alkaline paste that speeds drying!"

A rapid, all-purpose paste gives strong joints in resin, oil, and CO_2 cores.

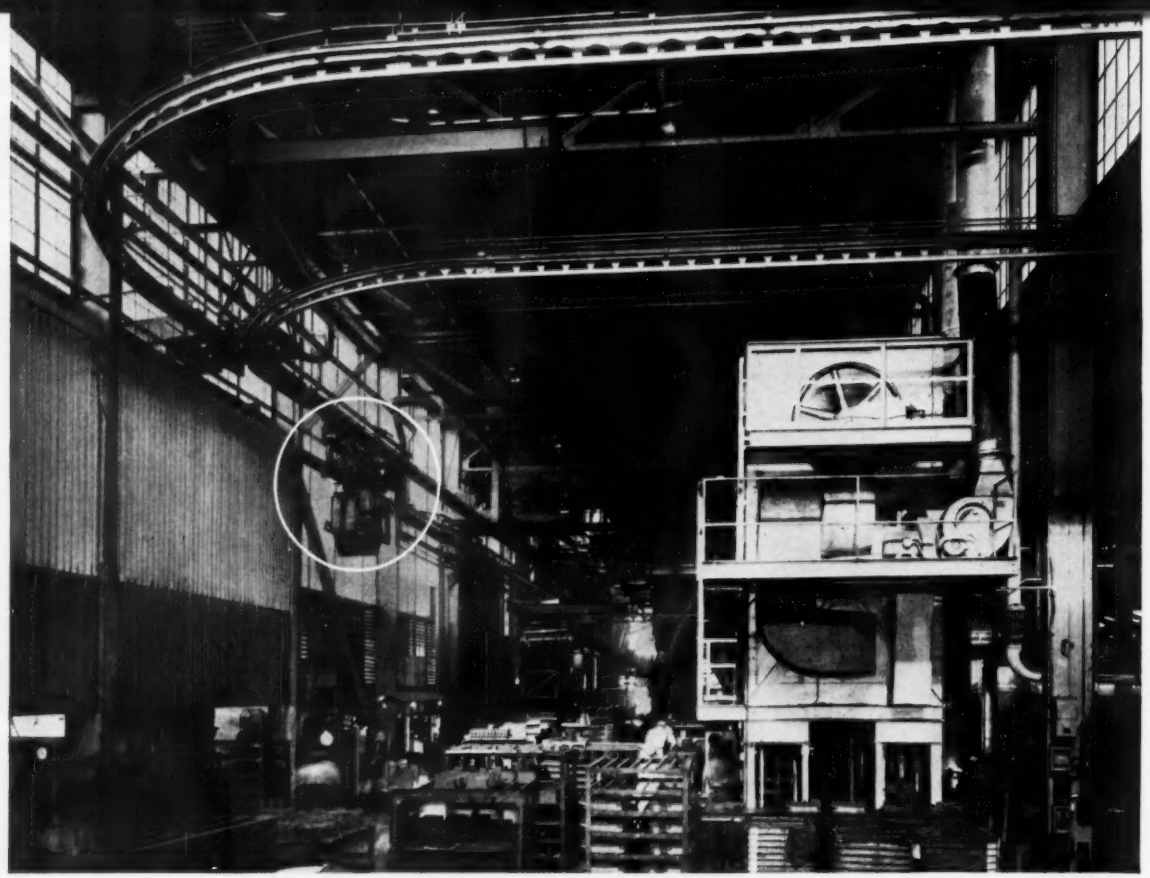
Convince Yourself with a

TRIAL ORDER

For further information or sample material, contact The Borden Chemical Company, Dept. F-4, 350 Madison Avenue, New York 17, N. Y.

IF IT'S A Borden Chemical ...IT'S GOT TO BE GOOD

©T.B.C.



Automatic sand distribution system. Encircled is a bucket carrier with 2000 lbs. of molding sand enroute to one of 17 stations as preselected.

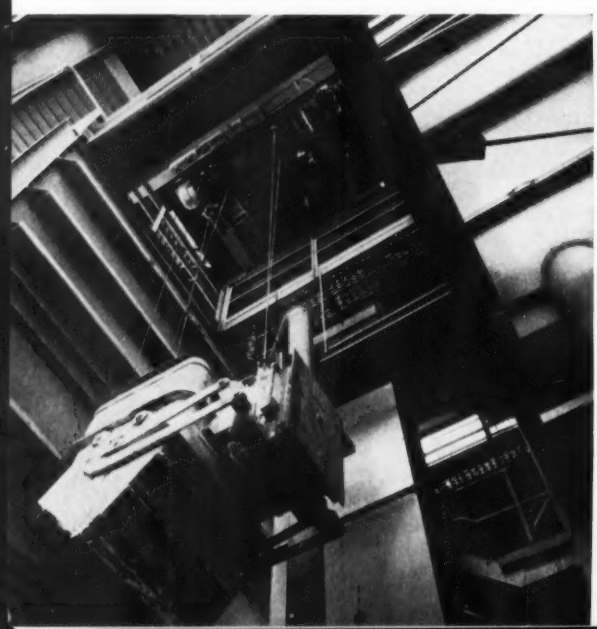
General Metals Blanketed

Extensive Overhead Installation Serves Nearly

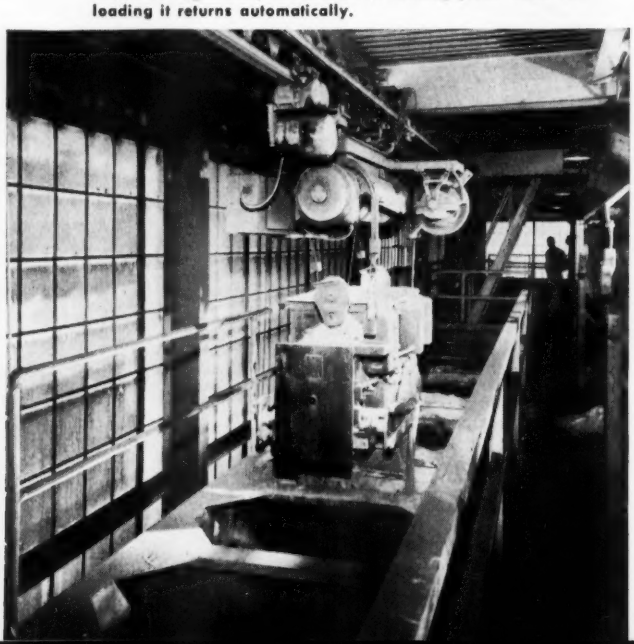
CLEVELAND Tramrail is proud of the important role it has been given by General Metals Corporation in their new foundry at Oakland, California. The new plant, which is reputed to have the most complete facilities in the West, is another outstanding addition to a list of more than 1000 Cleveland Tramrail-equipped foundries.

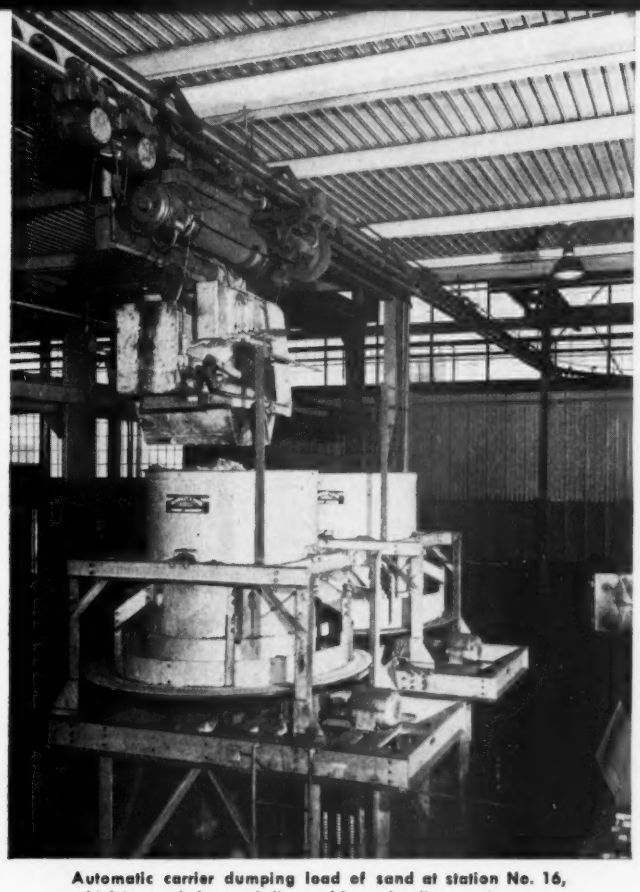
Nearly every department is served by Cleveland Tramrail. Both manually and electrically operated equipment in capacities from ½ to 10 tons are in operation. Wide use is made of transfer cranes. There are two automatic dispatch systems for core sand and blending materials. One delivers materials automatically to 17 stations. The illustrations

Automatic system lifting 2000 lb. bucket load of core sand blending materials to storage bins above.

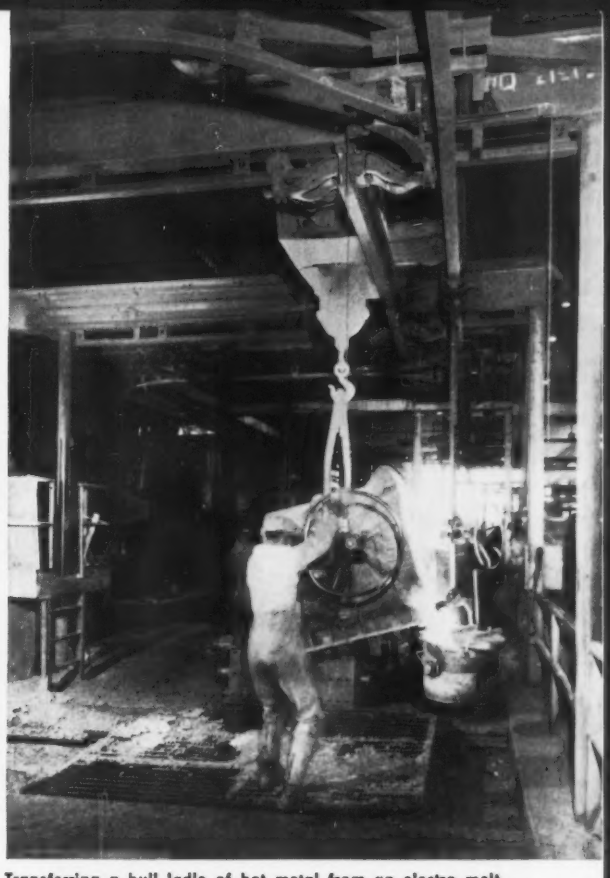


Here bucket has reached high position and carrier is unloading at one of eight bins, as selected at starting point. After unloading it returns automatically.





Automatic carrier dumping load of sand at station No. 16, which is supply for sand slinger. After unloading, carrier returns to the sand muller. Only attendant is man stationed at muller.



Transferring a bull ladle of hot metal from an electro melt furnace to a pouring ladle.

with Cleveland Tramrail

Every Materials Handling Requirement

on these pages represent only a fraction of the entire Cleveland Tramrail installation.

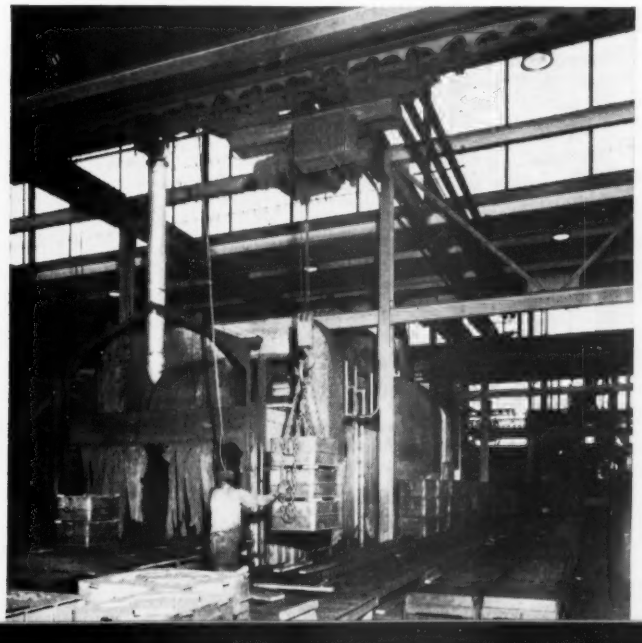
For modern, efficient foundries like General Metals, where quality, performance and service are important to keep production costs low, the popular choice is Cleveland Tramrail.

Write for free Engineering and Application Booklet No. 2008. Packed with valuable information.

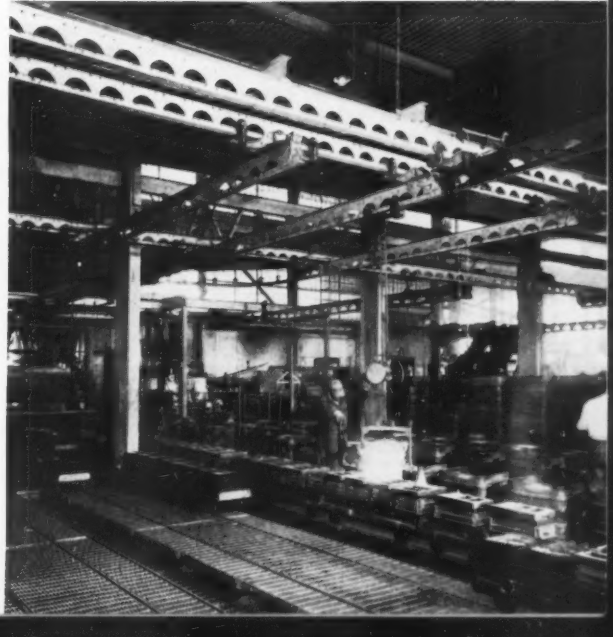
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3844 EAST 286TH ST. WICKLIFFE, OHIO.

Circle 578 on Page 53

10-ton Cleveland Tramrail crane handles large molds from drying oven to two mold conveyors.



An extensive interlocking crane system serves the light pouring floor. These smooth rolling cranes make pouring fast, safe and easy.



This bank of manifold-mounted Speed King valves controls a foundry mold flask indexing unit, custom-built for a major automotive manufacturer.

to simplify piping and wiring of complex control valve installations, use...

VALVAIR'S NEW SPEED KING® MANIFOLDS

Cut material and assembly labor costs on multiple control valve installations . . . use Valvair's new 2 and 3-station manifolds! Common inlet, exhaust and wiring passages, plus equally-spaced cylinder ports, eliminate unnecessary piping and wiring . . . keep installations neat. Cast aluminum manifolds may be ganged for installation of any number of valves. O-rings assure leak-free connections.

VALVES — 2 or 3 stations for 3/8-3/4 in. NPT standard Speed King or 1/4 in. NPT plug-in Speed King Valves, single or double solenoid, 2, 3 or 4-way. Remote operated, speed controlled* and power-centered neutral* valves may be used in any number and combination.

PIPING — Intake and exhaust ports common to all stations. Pipe threads, both ends, and O-ring grooves.

PORTING — Optional size cylinder ports. Side and bottom outlets, flush pipe plugs.

WIRING — Large conduit passage, with side access cover, common to all stations. Pipe threads, both ends, and O-ring grooves. Pilot leads (standard Speed King valves) encased in flexible conduit, integral pilot connections for 1/4 in. NPT plug-in Speed Kings.

MOUNTING — 2 mounting points per manifold. For ganging, kits of O-rings and through bolts are offered.

**Standard Speed King valves only.*

Easier in-use service is another benefit! Individual pilots, valves or entire manifolds are replaceable as units to minimize machine downtime.

And, Speed King manifolds *are available for immediate delivery from stock.* Before you engineer new equipment or up-grade machines now in service, investigate the design and cost advantages of Valvair Speed King manifolds.

For more information, write for Bulletin D-58. Address Dept. F-459, Valvair Corporation, 454 Morgan Ave., Akron 11, Ohio.

Representatives in principal cities.

Valvair AKRON 11, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

Other INDUSTRIAL DIVISIONS of IBEC: The Sinclair-Collins Valve Co., The Bellows Co., Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio.

8005

Late News

THE ROAD BACK: The foundry industry is making a comeback from its worst year since World War II. Preliminary figures on 1958 castings shipments show a total of 13,178,880 tons, nearly 200,000 tons under the previous low of the 13,377,000 tons shipped in 1946.

Contrary to custom, however, December was the best month in the year, with a total of 1,263,344 tons. This figure represents a 31 per cent increase over July, the worst month, when only 964,681 tons were shipped. Gray iron alone surpassed this total in December by shipping 997,608 tons. The last quarter of 1958 was the best of the year.

Virtually all indications seem to point to a continuation of this improved situation. Car sales are going well enough to make the automotive companies dream of surpassing even the 5½-million year they had hoped for. The railroads are back in the market, the road building program is beginning to move, and building is holding up satisfactorily, with the spring boom still ahead.

EQUIPMENT SALES UP: The better business climate foundries are enjoying is being reflected in equipment sales, too. January was rated at 127.4 on the FEMA index, which uses the period 1947-49 as 100. It compares with 57.9 for January, 1958, and an average during 1958 of just over 89. For the last three months, the index has averaged about 118. The first quarter of 1958 averaged only 67.

ASF SHELL FOUNDRY: American Steel Foundries, Chicago, will convert its works at Indiana Harbor, Ind., to a production shell

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1956	71,709,489	9,817,287	1,133,128	9,862,887
1957				
Dec.	4,281,414	661,918	70,091	542,008
Total	65,688,592	9,220,405	1,026,951	8,876,400
1958				
Jan.	4,072,071	704 654	76,989	566,225
Feb.	3,491,441	611,394	64,971	466,657
Mar.	3,718,132	624,165	64,866	524,035
Apr.	3,429 121	599,427	61,839	631,220
May	3 862,491	596,253	59,060	553 756
June	4,409,006	615,271	62,703	605,733
July	3,716,739	543,726	47,203	513 394
Aug.	4,203 034	580,844	66,877	592,727
Sept.	4,472,219	680 660	71,198	637,400
Oct.	5,091,207	707,378	90,707	757,722
Nov.	4,803,615	700,704	74,382	691,078
Dec.	4,973 670	761,494	80,593	712,779
Total	50,242,746	7,725,970	821,388	7,152,726

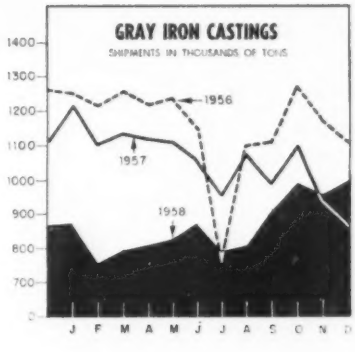
Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1958	1959
Jan.	57.9	127.4
Feb.	57.6	....
Mar.	85.9	....
Apr.	88.7	....
May	136.1	....
June	87.7	....
July	77.9	....
Aug.	74.1	....
Sept.	64 5	....
Oct.	118.9	....
Nov.	83.3	....
Dec.	137.0	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Total	Castings For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3]
1956	13,860,527	7,960,391	8,265,526	3,647,991	.....	2,624,146	406,191	1,746,902	817,762	.....
1957										
Dec.	864,226	443,670	557,154	226,356	9,810	148,074	23,173	73,500	62,325	675,838
Total	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	758,308	.....
1958										
Jan.	868 255	436,398	580,545	229,014	10,800	135,110	23,511	78,863	50,226	638,069
Feb.	753 306	389 708	503,175	203 717	10,245	116,168	25,959	67 606	40,398	632,490
Mar.	795,568	446,822	499,751	215,916	9,485	125 887	24,777	87,716	57,437	589,912
Apr.	806,720	457,498	483,999	210,344	8,015	121,489	25,401	112,292	63,539	582,446
May	820,054	472,192	469,026	203 025	5,671	134,312	23,498	123 017	70 201	570,293
June	867,948	541,904	503,252	245 651	5,773	135,477	22,928	129,671	76,620	572,706
July	791,560	465,650	430 882	185 275	3,999	157,478	19,928	110,790	72,481	580,155
Aug.	802,473	513,862	410,876	205,821	4,211	165,006	18,537	129,157	78,897	614,199
Sept.	916,704	537,717	518,185	227,414	4,622	175,323	20,783	125,693	76,720	644,834
Oct.	992,730	586,614	551,380	253 062	4,193	207 500	22,970	129 375	81 505	619,667
Nov.	958 306	505,290	575,586	231,669	3,426	201 704	18,801	98,326	63,889	602,375
Dec.	997 608	509,499	628,720	246,289	3 689	208,942	18,021	85,179	56,746	608,096
Total	10,371,232	5,863,154	6,155,377	2,657,197	74,129	1,884,396	265,134	1,277,685	788,479	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. [1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

Late News

molding plant. The first stage will be ready for operation in May, and the second stage will take another six months. ASF's projected expenditures on plant additions in the current fiscal year will total $7 million.

SCRAP EASIER: Prices of ferrous scrap have tended lower since a month ago. Reductions have been most noticeable in steelmaking grades, influenced by relatively slow demand from mills. Cast scrap prices have been fairly stable in most centers. Compared with the market a year ago, No. 1 cupola cast is up $3 to $7 a ton.

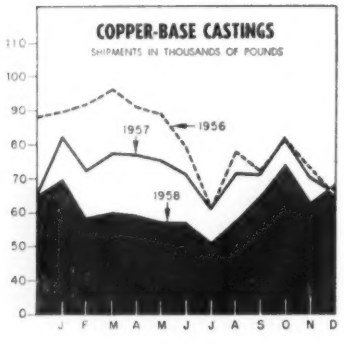
FOUNDRY CLOSINGS: Wisconsin Grey Iron Foundry Co., Milwaukee, ceased all operations as of March 2 and will sell all its foundry equipment . . . Richmond Malleable Castings Co., Richmond, Ind., ended operations on Feb. 14 and has sold all equipment and supplies.

T&RI COURSES: AFS Training & Research Institute will offer a course on "Gating and Risering of Castings" at Los Angeles, April 24-25, and at Berkeley, Calif., April 27-28. On May 4-5, a course on "Melting of Copper-Base Alloys" will be held at Hamilton, Ont., Canada. Tuition for each course is $45. Registrations can be made with the Institute, Golf & Wolf Rds., Des Plaines, Ill.

FEF OFFICERS: Officers of the Foundry Educational Foundation were elected at the annual meeting in Cleveland on March 18-19. They include Frank G. Steinebach, editor, FOUNDRY, Cleveland, president; Robert B. Parker, assistant to president-personnel, American Brake Shoe Co., New York, vice president; Warner B. Bishop Jr., vice president-general manager, Archer-Daniels-Midland Co., Federal Foundry Supply Div., Cleveland, secretary; and Ernest M. Knapp, president, Ferro Machine & Foundry Co., Cleveland, treasurer.

FOUNDRIES SAFER: Ferrous foundries had improved safety records in the fourth quarter of last year but the record of nonferrous shops was poorer, the U. S. Department of Labor reports. Injury frequency rate of gray and malleable iron foundries was 20.7, against 24. 7 in the third quarter and 21.2 a year ago. Steel foundry rate of 14.8 compares with 17.3 the previous quarter and 16.4 in 1957. Nonferrous

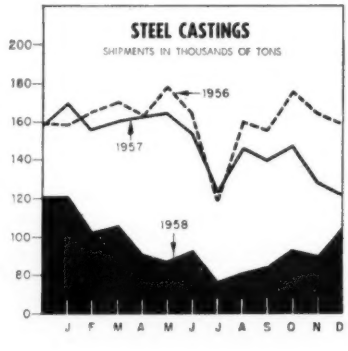
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1956	966,306	866,545	57,522	.....
1957				
Dec.	65,685	59,580	3,049	31,553
Total ..	874,627	789,014	44,789	.....
1958				
Jan.	69,707	63,294	3,327	30,341
Feb.	58,356	52,579	3,202	27,243
Mar.	60,157	54,007	3,395	25,434
Apr.	59,311	53,271	3,385	25,621
May	57,506	51,634	3,077	22,867
June	57,124	51,967	3,001	21,578
July	51,124	46,636	2,351	20,518
Aug.	57,790	52,981	2,425	24,851
Sept.	64,447	58,435	2,888	25,655
Oct.	74,012	67,564	3,239	26,726
Nov.	62,746	57,386	2,604	24,928
Dec.	67,905	61,119	3,535	25,078
Total ..	740,155	670,873	36,429	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

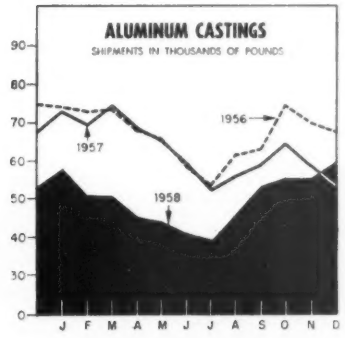
	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1956	1,931,987	1,512,290	368,918	1,444,768	1,122,109	345,091	487,219	390,181	23,827	.....
1957										
Dec.	120,787	92,125	23,403	88,101	66,468	21,808	32,686	25,657	1,595	327,337
Total	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Jan.	120,722	94,717	22,545	87,525	68,203	21,115	33,197	26,514	1,430	304,907
Feb.	103,297	79,708	16,647	74,283	56,781	15,273	29,014	22,927	1,374	282,358
Mar.	106,233	82,195	16,180	77,564	60,208	15,240	28,669	21,987	940	252,840
Apr.	91,464	69,121	11,956	65,639	48,998	11,107	25,825	20,123	849	229,503
May	87,002	66,086	10,416	61,105	45,967	9,463	25,897	20,119	953	211,346
June	92,861	71,624	14,185	67,227	50,919	12,987	25,634	20,705	1,198	190,779
July	68,802	48,618	5,400	46,858	32,161	4,656	21,944	16,457	744	200,272
Aug.	80,886	59,816	8,021	57,539	42,069	7,090	23,347	17,747	931	196,300
Sept.	85,277	64,586	9,205	60,392	44,890	7,905	24,885	19,696	1,300	196,482
Oct.	95,389	73,367	12,254	67,906	51,065	10,980	27,483	22,302	1,274	184,925
Nov.	85,267	65,788	9,648	59,793	45,808	8,501	25,474	19,980	1,147	193,960
Dec.	103,800	81,360	13,187	76,015	59,171	11,934	27,785	22,189	1,253	214,352
Total	1,211,000	856,986	149,644	801,846	606,240	136,251	319,254	250,716	10,393	.....

[1]Source: Bureau of Census. [2]For sale only.

shops had a 20.7 rate, up from 15.1 in the third quarter and 16.6 the year before.

PERSONALS: Milton A. Karrer has been made vice president-manufacturing, Crucible Steel Casting Co., Milwaukee . . . James W. Ferguson has become manager of field sales, Durez Plastics Div., Hooker Electrochemical Corp., North Tonawanda, N. Y. . . . Richard L. and Thomas J. Gutenkunst have been elected vice presidents, Milwaukee Malleable & Grey Iron Works, Milwaukee . . . Harry C. Ahl is manager, casting sales, Custom Castings Div., Malleable Iron Fittings Co., Branford, Conn. . . . New appointments at Griffin Pipe Div., Griffin Wheel Co., Chicago, a subsidiary of American Steel Foundries, include S. C. Prest, vice president and general manager; Frank Marold, vice president-sales; and O. L. Dean, manager of operations . . . Harold R. Warsmith has been named factory manager, Jeffrey Mfg. Co., Columbus, Ohio. John R. Simon succeeds him as general superintendent . . . James P. Spresser has been appointed manager of planning, standards, and methods at the Everett, Mass., foundries, Foundry Dept., General Electric Co.

MISCELLANY: Precision Castparts Corp., Portland, Oreg., has added 30,000 sq ft to its plant and has enlarged its research and development activities in high-strength, high-temperature metals . . . Foundries of Allis-Chalmers Mfg. Co., Milwaukee, rang up a 34 per cent improvement in their accident frequency rate during 1958 . . . Advance Foundry Co., Dayton, Ohio, has reached a mutual marketing agreement with Buckeye Steel Castings Co., Columbus, Ohio, for Advance to furnish steel castings to the automotive industry . . . Forging & Castings Div. of Allegheny Ludlum Steel Corp., Ferndale, Mich., has been expanded to include the company's Buffalo foundry . . . A new addition agent for shell molding sand is said to prevent burn-in, improve sand flowability, and provide better casting surface in production of low-carbon steel castings . . . United Foundry & Engineering Co., Pittsburgh, has added a $3 million construction program to its improvement program begun in 1955. It will affect principally its steel foundry . . . Blaw-Knox Co., Pittsburgh, has acquired Aetna-Standard Engineering Co., Ellwood City, Pa., and is operating it as a separate division.



PRODUCTION WORKERS

Estimated Number

	Dec. 1958	Nov. 1958	Avg. 1958
Ferrous	208,100	203,500	197,200
Nonferrous	62,300	61,500	57,800

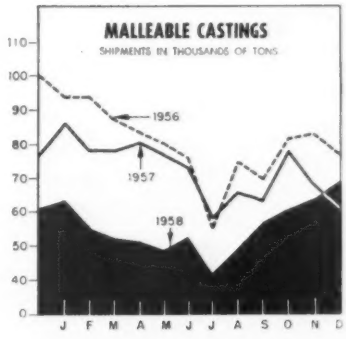
Average Weekly Earnings

Gray Iron	$92.28	$90.48	$83.76
Malleable Iron	96.87	91.03	85.96
Steel	98.50	95.73	91.37
Nonferrous	98.71	96.63	92.83

Average Weekly Hours

Gray Iron	39.1	38.5	36.9
Malleable Iron	40.7	38.9	37.7
Steel	39.4	38.6	37.6
Nonferrous	41.3	40.6	39.5

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1956	794,581	171,181	245,421	376,230	.....
1957					
Dec.	53,084	9,284	16,724	26,978	86,323
Total	751,818	143,991	232,326	373,586	.....
1958					
Jan.	57,845	10,724	18,082	28,937	77,067
Feb.	50,695	9,601	15,456	25,279	75,647
Mar.	50,547	9,311	15,255	25,918	63,600
Apr.	44,948	9,531	13,369	21,956	60,317
May	44,093	9,312	13,648	21,091	59,666
June	40,701	8,644	13,679	18,292	63,670
July	38,818	8,658	12,342	17,714	68,618
Aug.	45,034	9,034	14,426	21,505	71,135
Sept.	52,796	10,261	16,241	26,254	72,819
Oct.	55,699	10,932	17,189	27,511	73,474
Nov.	55,793	10,539	16,942	28,264	76,370
Dec.	59,487	10,874	18,970	29,579	78,732
Total	596,456	117,421	195,599	292,300	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1956	951,868	557,636	812,905	479,563	138,963	78,073	.....
1957							
Dec.	60,425	34,343	48,694	27,218	11,731	7,125	74,863
Total	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Jan.	62,734	34,920	51,440	28,516	11,294	6,404	67,292
Feb.	54,650	31,006	45,419	25,381	9,231	5,625	59,047
Mar.	51,708	29,624	43,368	24,333	8,340	5,291	54,330
Apr.	50,695	29,388	41,794	23,605	8,901	5,783	47,664
May	48,306	26,656	40,092	21,710	8,214	4,946	46,603
June	51,882	31,077	42,910	25,679	8,972	5,398	48,260
July	41,865	24,479	33,857	20,023	8,008	4,456	58,340
Aug.	49,252	29,414	41,734	24,696	7,518	4,718	55,145
Sept.	56,836	31,999	45,945	26,370	10,891	5,629	58,405
Oct.	60,981	40,014	50,181	31,992	10,800	8,022	63,425
Nov.	63,356	35,221	50,063	28,409	13,293	6,812	66,725
Dec.	68,385	40,041	53,797	32,883	14,588	7,158	66,725
Total	660,640	382,839	540,660	313,597	120,050	70,242	.....

Prices of Foundry Metals and Coke

(As of March 30, 1959)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	68.50	69.00
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 32.25; tin bronze, No. 225, 43.25; No. 245, 37.00; High-leaded tin bronze, No. 305, 36.50; No. 1 yellow, No. 405, 28.50; manganese bronze, No. 421, 29.75.

ALUMINUM: 99 per cent plus primary ingots 26.80. Secondary No. 12 alloy, 21.75-22.00. Deoxidizing grades: No. 1, 23.75; No. 4, 19.75.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 31.50, delivered Connecticut valley.

ZINC: High grade 12.00, delivered. Die casting alloy No. 3, 13.50; No. 2, 14.00, delivered.

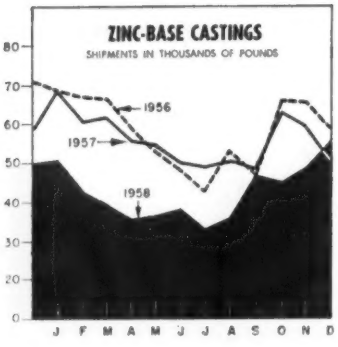
IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$33.00-34.00	$53.00-54.00	.....	.....	.....	.....	$51.00-52.00
Boston*	**30.00	**33.00	.....	.....	**34.00	.....	.....
Buffalo	39.00-40.00	**47.00-48.00	.....	.....	**51.00-52.00	.....	55.00-56.00
Chicago	42.00-43.00	48.00-49.00	.....	55.00-56.00	55.00-56.00	58.00-59.00	57.00-59.00
Cincinnati*	**37.50-38.50	**45.00-46.00	**40.00-41.00	.....	**49.00-50.00	.....	**57.00-58.00
Cleveland	39.00-40.00	47.00-48.00	38.00-39.00	47.00-48.00	50.00-51.00	65.00-66.00	59.00-61.00
Detroit*	**30.00-31.00	**41.00-42.00	**32.00-33.00	**45.00-46.00	.....	.....	.....
Los Angeles	38.00	**44.00	.....	.....	.....	.....	.....
New York*	29.00-30.00	36.00-37.00	34.00-35.00	.....	.....	.....	.....
Philadelphia	38.00	41.00	43.00	.....	49.00-50.00	68.00	.....
Pittsburgh	38.00-39.00	45.00-46.00	.....	39.00-40.00	51.00-52.00	.....	58.00-60.00
St. Louis*	36.00	50.00	38.00	50.00	.....	.....	.....
San Francisco	36.00	44.00	28.00	40.00	40.00	.....	.....
Seattle	33.00	31.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

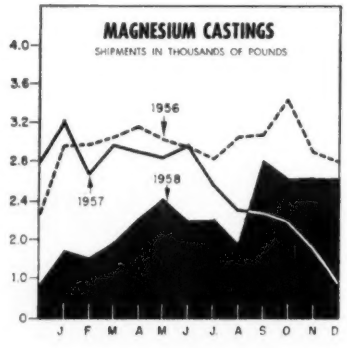
Foundry Statistics



PIG IRON

PRODUCTION—Net Tons**

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1957	2,275,789	3,697,335	7,452,203
1958			
Jan.	100,097	232,802	415,859
Feb.	106,921	193,429	319,094
Mar.	156,386	227,785	389,254
Apr.	136,180	173,139	424,954
May	127,436	165,045	396,009
June	121,869	167,192	342,617
July	123,075	156,582	402,850
Aug.	141,185	145,216	396,511
Sept.	133,556	234,752	416,026
Oct.	146,386	257,111	575,806
Nov.	175,210	257,131	489,095
Dec.	154,007	272,375	429,299
Total[3]	1,622,320	2,448,917	4,954,854
1959			
Jan.	190,392	263,105	479,019



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1956	693,728	449,516	.....
1957			
Dec.	50,112	30,513	58,583
Total	669,775	431,509	.....
1958			
Jan.	50,568	30,368	55,883
Feb.	42,687	27,482	50,676
Mar.	39,719	26,782	43,366
Apr.	35,796	23,830	27,634
May	36,447	24,588	33,438
June	38,132	25,993	34,888
July	32,765	22,843	41,534
Aug.	35,860	26,971	45,066
Sept.	47,127	33,520	50,762
Oct.	45,045	36,103	58,154
Nov.	48,431	34,054	57,864
Dec.	55,600	39,768	56,756
Total	508,177	352,302	.....

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1957	4,160,891	218,178	246,851
1958			
Jan.	306,794	16,102	14,426
Feb.	260,940	14,014	7,740
Mar.	270,214	13,472	8,753
Apr.	262,007	13,975	9,585
May	256,204	12,001	11,764
June	262,883	12,098	15,549
July	239,140	10,550	12,140
Aug.	247,428	13,196	32,309
Sept.	300,173	14,994	27,759
Oct.	300,115	17,393	34,273
Nov.	287,013	14,862	31,397
Dec.	321,741	16,610	25,450
Total	3,314,652	169,267	231,145
1959			
Jan.	.....	.....	.....

MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

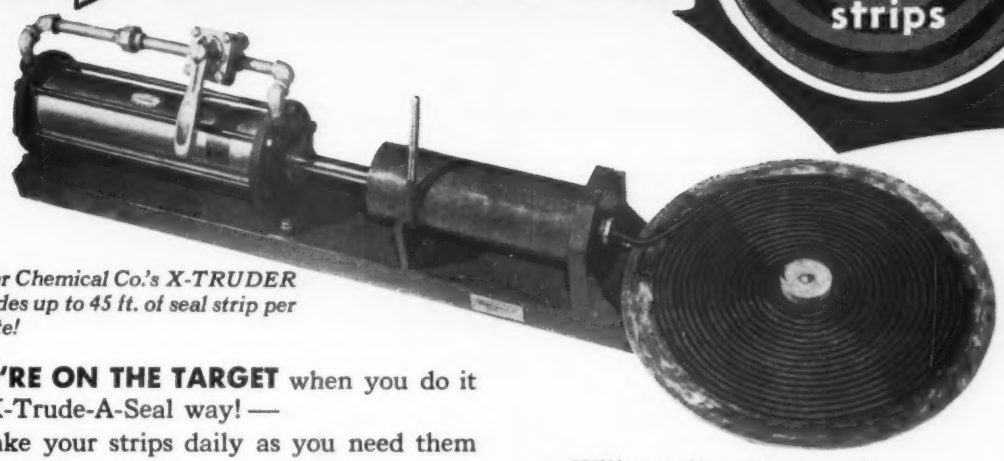
	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1956	36,168	33,580	.....
1957			
Dec.	1,533	1,408	4,823
Total	30,322	28,452	.....
1958			
Jan.	1,881	1,756	5,227
Feb.	1,803	1,730	5,589
Mar.	1,975	1,860	5,555
Apr.	2,215	2,141	5,555
May	2,422	2,196	5,200
June	2,205	1,996	5,515
July	2,200	2,063	6,706
Aug.	1,869	1,808	6,086
Sept.	2,804	2,581	6,083
Oct.	2,627	2,479	5,463
Nov.	2,615	2,523	4,063
Dec.	2,612	2,384	5,115
Total	27,228	25,517	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

DO IT YOURSELF

WHITEHEAD'S X-TRUDE-A-SEAL

Costs less than any packaged preformed strips



Stoller Chemical Co.'s X-TRUDER extrudes up to 45 ft. of seal strip per minute!

YOU'RE ON THE TARGET when you do it the X-Trude-A-Seal way! —

- Make your strips daily as you need them
- Re-extrude all leftovers the next day to desired sizes
- Sizes from ¼" to ¾" diameter

- Will not dry out or crack
- Economical — eliminates waste of material
- Applies faster than preformed extruded strips
- Reduces chipping, grinding, porous metal, leakers
- Eliminates uneven casting walls, excessive fins

Of course, Joint Seal is available for hand rolling, hand gun, or use with Stoller X-Truder

***FIND OUT HOW MUCH YOU CAN SAVE** — contact your distributor . . . or write direct*

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LYQUAGRIP
Ready-to-use core paste

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Binder for baking with controlled oven temperatures

JOINT SEAL
Plastic compound for perfect sealing

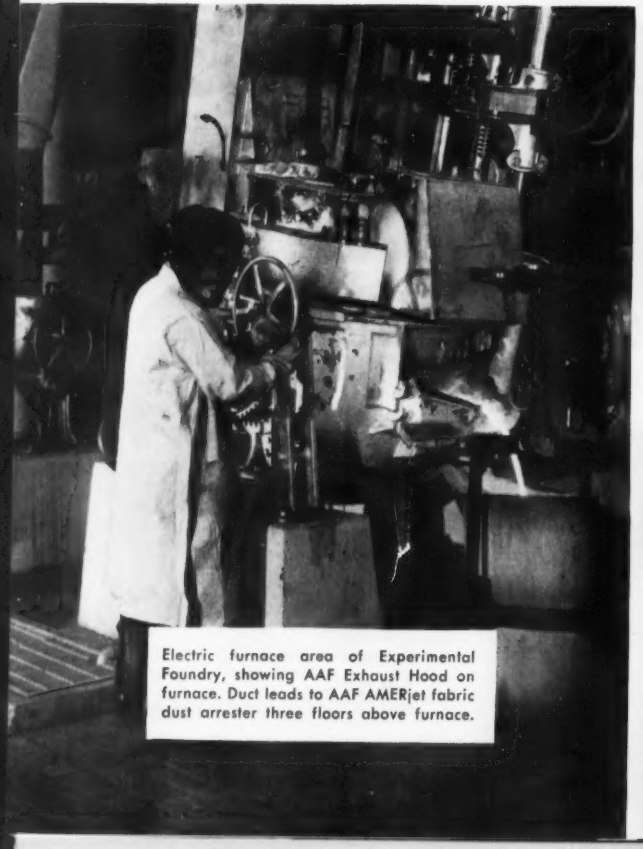
LYQUAFACE
The liquid sand grain coating

DOB-IT
Ready-to-use core mudding compound

Circle 580 on Page 53

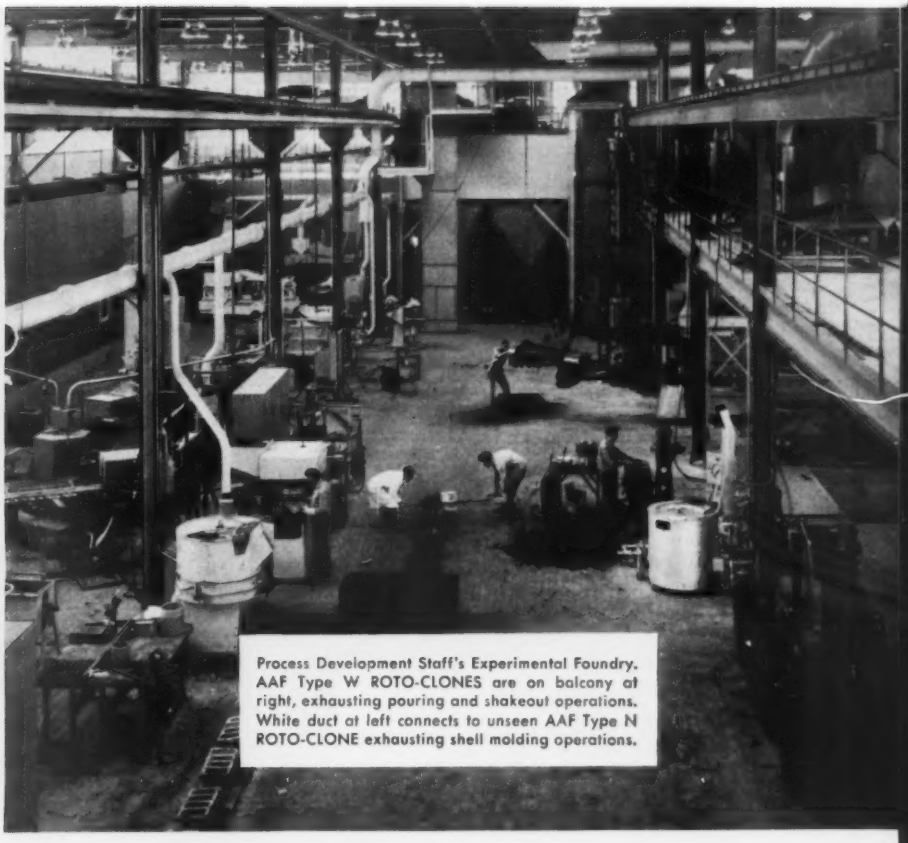
General Motors Technical Center, Warren, Michigan. Central staff research, styling, manufacturing and engineering facilities are grouped around a 22-acre artificial lake — 25 buildings, ranging from gate-houses to laboratories, test cells and design studios.

AAF Controls Dust at New



Electric furnace area of Experimental Foundry, showing AAF Exhaust Hood on furnace. Duct leads to AAF AMERjet fabric dust arrester three floors above furnace.

One of the pattern shops. Process-dust exhaust ducts lead to AAF Skimmer Pre-cleaner (extreme right foreground)—one of five systems each with Airmat Dustbox final collector.



Process Development Staff's Experimental Foundry. AAF Type W ROTO-CLONES are on balcony at right, exhausting pouring and shakeout operations. White duct at left connects to unseen AAF Type N ROTO-CLONE exhausting shell molding operations.

General Motors Technical Center

Six different types of AAF products solve Center's varied dust problems

From this beautiful new General Motors experimental center will come many of the new methods, new designs, new products of tomorrow. *Though its function is experiment, there's nothing experimental about the center itself.* The 25-odd buildings are as functionally perfect as it was humanly possible to make them. All equipment was carefully selected—on proven performance records—to meet the punishing, day-to-day demands of GMC testing and experimentation.

As one of the very first users of AAF dust collectors, General Motors has had years of experience in putting these products to their stiffest tests in virtually every division of the company. Logically, when the new Technical Center was being planned, those plans included AAF dust control.

AAF manufactures a *complete* line of dust control equipment backed by the world's most *experienced* dust control men. Call your AAF representative, or write for folder, *Five Basic Dust Problems.* Address: Mr. Robert Moore, American Air Filter Co., Inc., 266 Central Ave., Louisville, Ky.

AAF American Air Filter

BETTER AIR IS OUR BUSINESS

Circle 581 on Page 53

PURECO CO_2 QUICK-HARDENS LARGEST PROPELLER MOLD

19½-foot, 41,000-pound propeller cast in CO_2 hardened mold by a West Coast shipyard. No baking. No buckling. Sand re-usable. Machine shop costs reduced.

This is the largest propeller ever cast in the United States from a sand mold quick-hardened with Pureco CO_2.

The CO_2 process was employed, hardening the mold within minutes . . . compared to a former high-cost, baking process requiring up to 75 hours.

The Pureco equipment needed is simple and low in cost.

Your Pureco representative will be glad to arrange for a demonstration of the CO_2 process in your plant, or supply you with further information at no cost or obligation to you.

PURECO CO_2

Pure Carbonic Company

A Division of Air Reduction Company, Incorporated

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AT THE FRONTIERS OF PROGRESS YOU'LL FIND AN AIR REDUCTION PRODUCT

Circle 582 on Page 53

Circle 581 on Page 53

New Towmotor "Pace-Maker" Model Fork Lift Truck

Sets pace for fast flow!

Watch agile Towmotor lift trucks keep multi-ton loads flowing through busy, congested mills and factories—and you'll know why they lead the way in materials handling. Notice the fast pace they set for *every department* as they hustle all types of materials through receiving, production and shipping.

Discover why Towmotor lift trucks have the tough-as-nails stamina for *continuous operation*—cutting handling costs to bedrock day after day. Ask for new "Pace-Maker" Booklet SP-23 . . . and Certified Job Studies applying to your specific handling operations. (Also ask about new foot-controlled *Towmostatic Drive*, available now on some Towmotor models.) Write Towmotor Corporation, Cleveland 10, Ohio.

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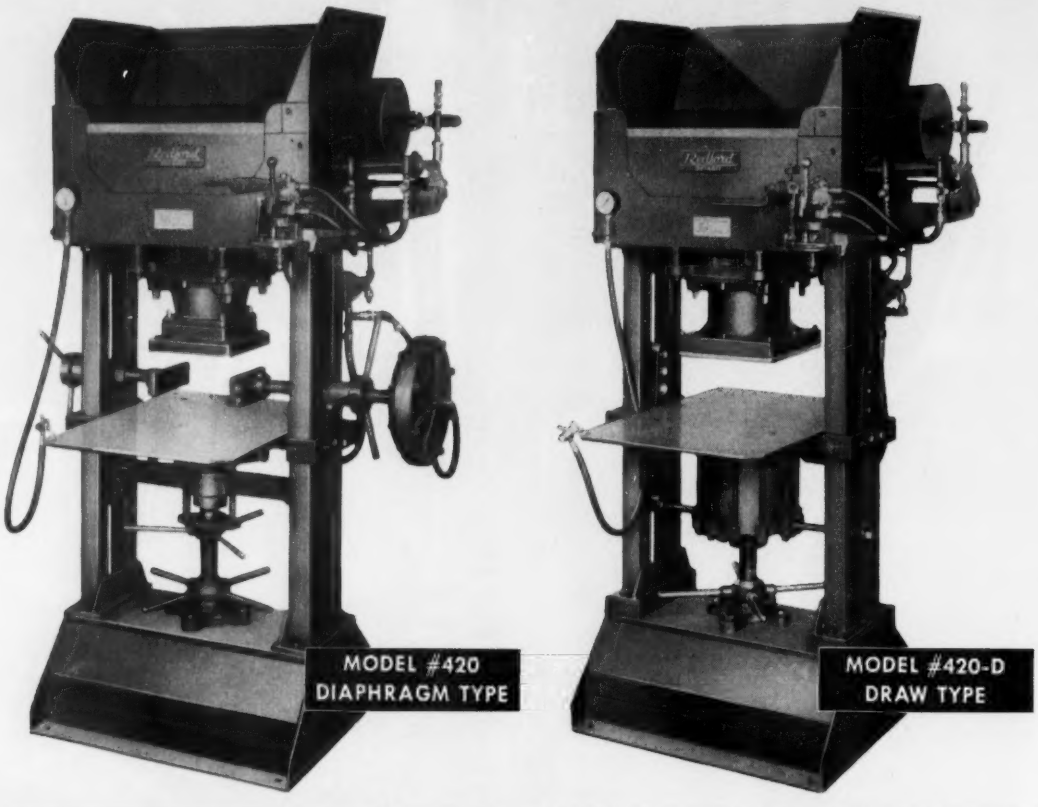

Redford CORE BLOWER AND CORE SHOOTER

Here is a core making machine that is setting new standards in versatility and performance. The #420 Redford is equipped *to make cores up to 20 lbs. using any type binder*. Proven core blowing practices may be continued to do the most intricate work and to assure maximum production. Tough sand mixes which do not readily lend themselves to blowing can be used in ramming or shooting cores.

Core shooting requires a fast acting machine having sufficient capacity to propel sand at high velocity through a large shoot head opening. The large shoot head opening offers little resistance to the flow of sand and allows any sand to be rammed into suitable open cavity core boxes ahead of the propelling air.

With the #420 Redford we offer a tool that allows you the widest choice of application. It is a properly balanced combination of standard Redford practices that makes possible a low cost machine of greater usefulness and versatility to meet today's core room requirements.

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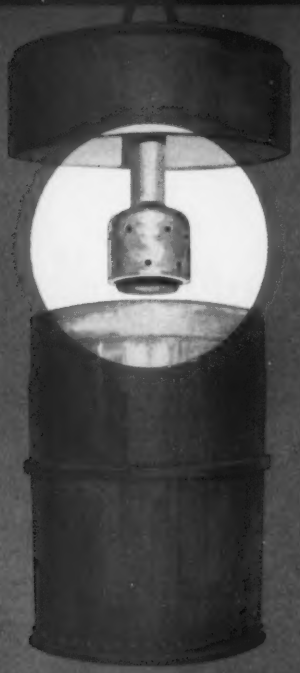
For Complete Information write for
BULLETIN #42

Circle 584 on Page 53
Circle 585 on Page 53→

DUCTILE IRON



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In plunging, a refractory basket containing the magnesium additive is plunged into an already filled ladle of iron. Flame and smoke are virtually eliminated. Slag volume is significantly reduced. Magnesium recovery is more consistent. SAVINGS OF UP TO 50% OF ALLOY COSTS ARE BEING REGULARLY OBTAINED.

SPECIAL PACKAGE

If the plunging technique fits your operation, you will be interested in Ohio Ferro-Alloys' special alloy package developed specifically for this technique. Our Sil-Mag alloys are now available in cans containing the exact weight required for specific ladle treatments. The package is designed for insertion directly in the plunger. Possible alloy losses in handling and weighing operations are eliminated.

MAXIMUM CONVENIENCE — MINIMUM COST . . .

Write for your copy of our new brochure, "Plunging Sil-Mag Alloys."

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Los Angeles • Minneapolis • Philadelphia • Pittsburgh • Salt Lake City
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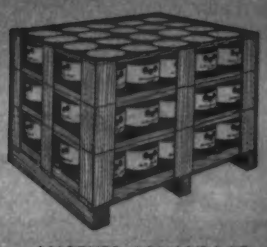

ANOTHER ADVANTAGE: Pallets holding sixty cans for convenient handling and storage.

Taylor Zircon Prolongs Ladle Life...

produces cleaner metal too

Taylor Zircon No. 717 Ramming Mix is a most effective lining for ladles handling various types of iron and steel. A St. Louis foundry uses No. 717 exclusively for receiving and pouring ladles in their stainless steel and high alloy operations. They call it the best lining material they have ever used, because:

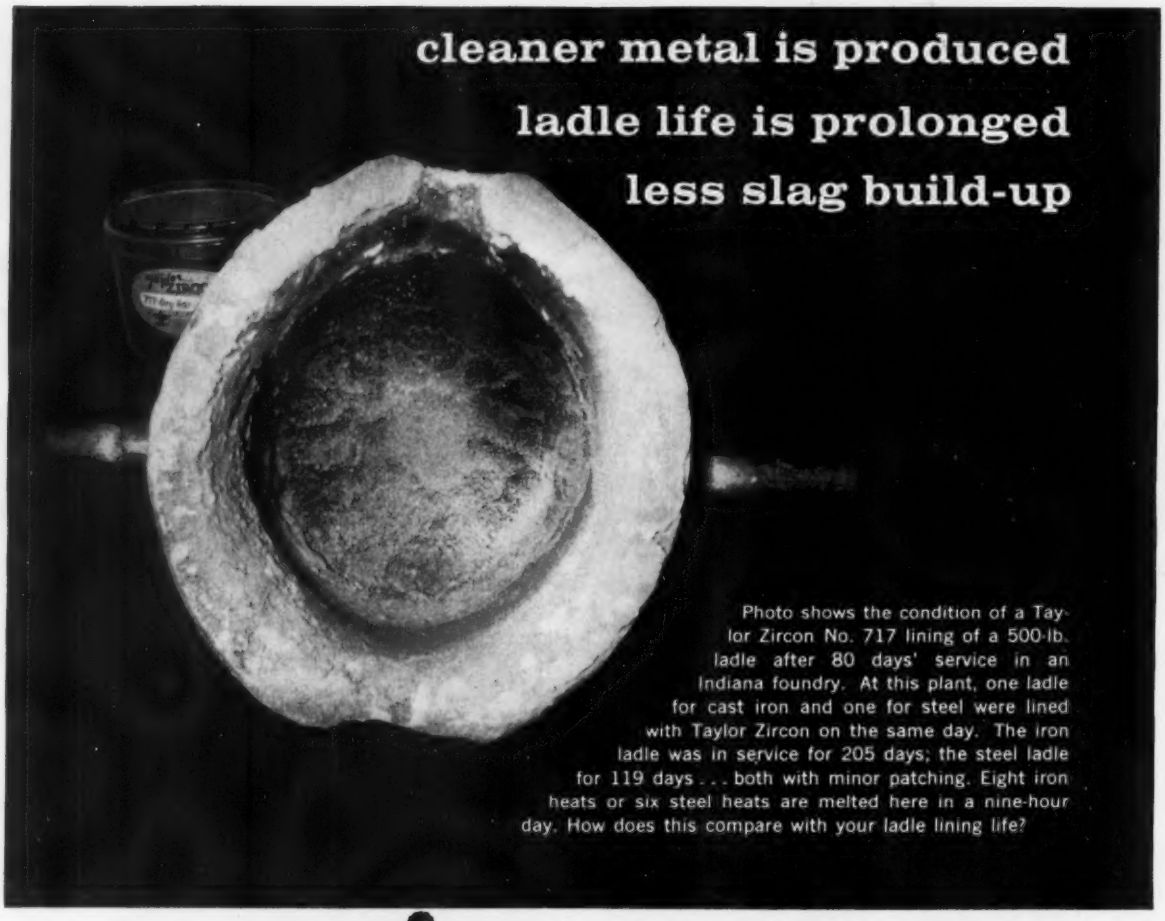

Photo shows the condition of a Taylor Zircon No. 717 lining of a 500-lb. ladle after 80 days' service in an Indiana foundry. At this plant, one ladle for cast iron and one for steel were lined with Taylor Zircon on the same day. The iron ladle was in service for 205 days; the steel ladle for 119 days . . . both with minor patching. Eight iron heats or six steel heats are melted here in a nine-hour day. How does this compare with your ladle lining life?

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
Hamilton and Montreal

The CHAS. TAYLOR SONS Co.
A SUBSIDIARY OF NATIONAL LEAD COMPANY
REG. U. S. PAT. OFF.

REFRACTORIES SINCE 1864 • CINCINNATI • OHIO • U.S.A.

POSITIVE DUPLICATION – EVERY TIME!

Exact duplication of one person's fingerprints by another person is impossible. Discovery of this amazing fact in 1891 changed the science of detection and identification throughout the world.

CUT CLEANING COSTS

You'll be able to track down and arrest cleaning room costs . . . when you start using CINCINNATI (PD) WHEELS. That's because all (PD) ° wheels (including the swing frame wheels shown above) are made by the remarkable CINCINNATI (PD) manufacturing process. Plus the fact that our trained and experienced grinding specialists are ready to assist you in quickly detecting the best grading for snagging operations.

KEEP COSTS CUT

When you have the CINCINNATI (PD) WHEEL that gives you the lowest labor and wheel cost, you then can be sure that every reorder wheel will act and grind exactly like the original wheel. The CINCINNATI (PD) manufacturing process gives you Positive Duplication . . . time after time after time. Once your cleaning costs are cut, they *stay* cut . . . with CINCINNATI WHEELS.

CALL CINCINNATI

For the help of a CINCINNATI grinding specialist in working down those cleaning room costs, call your CINCINNATI (PD) GRINDING WHEELS distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI®
GRINDING WHEELS

°Trade Mark Reg. U. S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Circle 587 on Page 53

Storage bins into which sand ingredients are conveyed by a Fuller-Kinyon Conveying System. Note the pipe-line system which permits ingredients to be conveyed into their respective bins.

One of two Fuller-Kinyon Pumps which convey sand ingredients to storage bins and from bins to mixers.

FULLER-KINYON CONVEYING SYSTEM HANDLES THREE DIFFERENT MATERIALS EFFICIENTLY, WITHOUT WASTE

To reduce costs and speed up handling of foundry sand ingredients with minimum waste, General Steel Castings Corporation, Granite City, Illinois, installed a Fuller-Kinyon Conveying System.

Here's what it does for them—

The system unloads corn flour, silica flour and bentonite from hopper bottom cars by means of Fuller-Kinyon Pumps which convey these materials through pipe lines to a number of storage bins. The flexibility of the system makes it possible to unload cars in a fraction of the time that would be required manually, *and*, waste due to spillage is eliminated. Two pumps used in the operation can be moved on narrow gage tracks for spotting under cars or bins. One pump is used mainly for unloading and delivery to storage—the other for delivery from storage to supply bins above the mixers. However, it is possible to unload cars and reclaim from storage simultaneously. Where bins are located so that they cannot discharge directly to a pump, an F-H Airslide® conveys from bins to the pump.

Prior to the Fuller installation, material was received in bags and manually unloaded, stored and transported to the mixers. It figures—*costs were much higher*. Now, waste has been eliminated! Another important feature—the company has realized extra savings by purchasing materials in bulk.

Fuller air-conveying systems are in operation in hundreds of plants throughout industry, cutting costs and increasing profits, day in and day out. The next time you have a materials-handling problem, why not get in touch with Fuller . . . chances are you will also profit.

FULLER COMPANY GENERAL AMERICAN TRANSPORTATION

Fuller

. . . . pioneers in harnessing AIR

FULLER COMPANY P-168 4038

148 Bridge St., Catasauqua, Pa.

SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION

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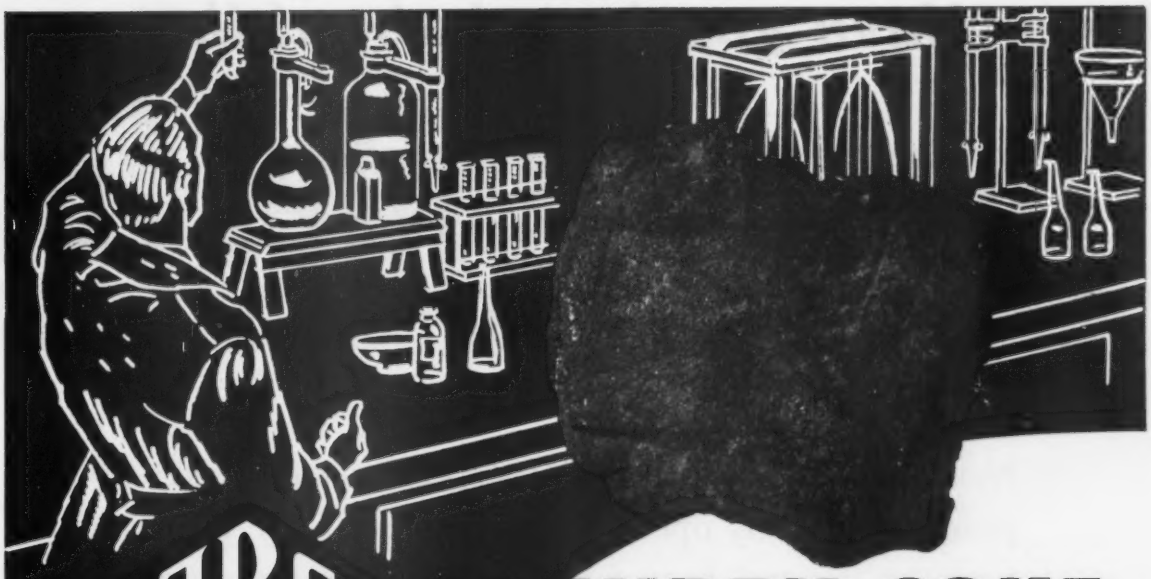
Circle 588 on Page 53



ABC

UNDRY COKE

—a product of 38 years of specialized experience and research

ABC Foundry Coke was produced for the first time in 1920. It was good coke then. It is a far better coke today — unsurpassed for efficient cupola results by any coke made anywhere.

Over the years, ABC has upgraded consistently the calibre of its coke. Its present-day superior standard of uniform quality is a combination of:

CUMULATIVE EXPERIENCE for which there is no substitute.

SCIENTIFIC BLENDING OF SPECIALLY PREPARED COKING COALS.

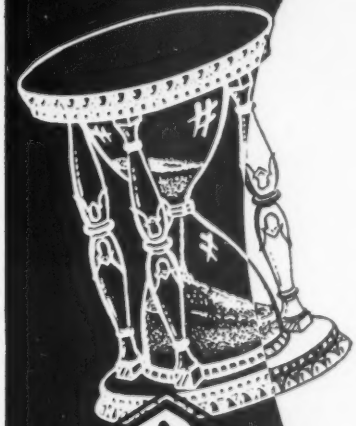
MODERN PLANT FACILITIES which have been constantly improved and expanded.

RIGID LABORATORY CONTROLS AND CHECKS of all materials used in coke production.

CUPOLA TESTING to forecast coke performance.

CAREFUL SCREENING to insure correct sizing for any cupola operation.

SKILLED PERSONNEL which includes highly trained technologists, chemists, engineers, metallurgists and research workers.



ABC

Whatever the requirements of your operation, you will find the right size . . . the right type of ABC Foundry Coke to give you the very best melting performance. Your inquiries are invited.

ALABAMA BY-PRODUCTS CORPORATION

General Sales Office: First National Building, Birmingham, Alabama

Sales Agents: GREAT LAKES FOUNDRY SAND COMPANY, Detroit; ST. LOUIS COKE & FOUNDRY SUPPLY CO., St. Louis; THE HANSON AND ORR COMPANY, Cincinnati; KIRKHUFF, MARSHALL AND COMPANY, Pittsburgh; KALFOUS, DUTHIE & COMPANY, LTD., San Francisco; ATWOOD COKE AND COAL COMPANY, Chicago

Have you heard about the

power center for

New A. O. Smith d-c Multiple-Operator unit makes it possible for many operators to weld from one power source with "at the arc" heat control — regardless of how far they're located from the power source! And this single power source can be housed in a dirt-free area — *drastically reduces maintenance costs!*

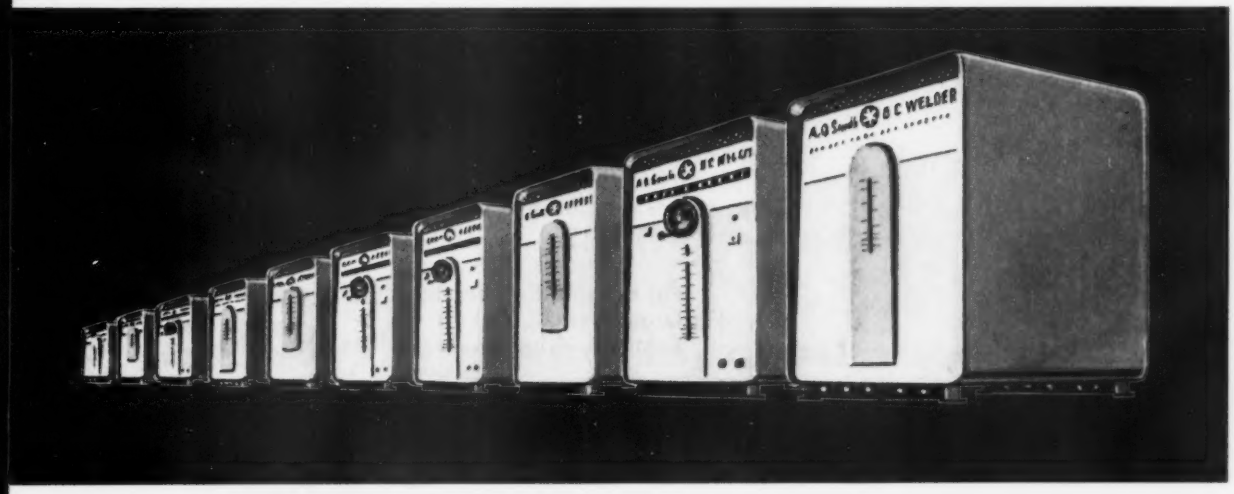
The A. O. Smith 1500-amp, d-c Multiple-Operator machine, at left, is one of three available "MO" units. Others are rated at 500 and 750 amps. These machines are specifically designed to replace or augment existing m-g sets or single-operator transformer welding machines. They are particularly adaptable to foundry work because they allow operation of many arcs (through grids) . . . can be located away from trouble-causing dust, sand and other elements.

The illustrated Model A15000MO is a 1500-amp machine with a 100% duty cycle rating . . . offering 80 open circuit volts, 95% efficiency . . . compact, ageless silicon rectifiers and a 97% power factor correction.

foundry welding?

A. O. Smith's Multiple-Operator unit is a d-c, constant potential type power source which provides upwards of 1500 amperes of d-c current from a single unit. Individual operator requirements are provided by means of series resistance grids which offer "at the site" amperage selections. For example: Model A15000 is a 1500 ampere unit which can be housed in a dirt-free area or room. A single cable from the power source to a terminal block near the welders' stations distributes current to the individual welding stations where it is drawn off by means of the individual operator's grid.

This A. O. Smith method minimizes equipment investment . . . holds maintenance and standby engineering costs to an absolute minimum. Further, it plays an important part in stabilizing power factor requirements . . . saves substantial sums on costs by equalizing power demands — even during peak welding periods.



A. O. Smith also offers a complete line of d-c machines —either selenium or silicon rectifier types, designed and built to provide long-lasting, trouble-free performance. Machine range from 200 to 2500 amperes. For more details on the multiple-operator machines, d-c rectifiers, or complete line of a-c transformers, contact your "man from A. O. Smith" or write direct.

Through research ... *a better way*

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin

A. O. Smith International S. A., Milwaukee 1, Wisconsin, U.S.A.

Circle 590 on Page 53

A Lester B. Knight & Associates, Inc. Case History

KNIGHT "WORKING TYPE" ENGINEERING LOWERS COSTS, INCREASES PROFITS

The Knight organization's practical "working type" approach to foundry problems results in specific, tangible benefits. For one client, Knight recommendations reduced manufacturing overhead 58%. Installation of flexible budgets, carried to the foreman level, improved methods and increased productivity, substantially reduced costs in all departments (without capital expenditures). These and other changes—in manufacturing approach and work-in-process methods—made possible a doubling of profits over the last three years.

For consultation on any foundry problem, large or small, call on Lester B. Knight & Associates, Inc.

KNIGHT SERVICES INCLUDE:

Foundry Engineering • Architectural Engineering • Construction Management • Organization Management • Industrial Engineering • Wage Incentives • Cost Control • Standard Costs Flexible Budgeting • Production Control • Modernization • Mechanization • Methods Materials Handling • Automation • Survey of Facilities • Marketing

Lester B. Knight & Associates, Inc.

Management, Industrial and Plant Engineers

Member of the Association of Consulting Management Engineers, Inc.

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917 Fifteenth St., N.W., Washington, D.C.
New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16
Knight Engineering Establishment (Vaduz), Zurich Branch, Bahnhofstrasse 17, Zurich, Switzerland
Lester B. Knight & Associates, G.M.B.H., Berliner Allee 47, Düsseldorf, Germany

Circle 591 on Page 53

Circle 590 on Page 53

Steel plant reports on use of B&W Kaocrete-32 in critical sections of electric furnace roofs:

•36% saving in installation time

•42% increase in roof life

•20% reduction in refractory costs

For further information on how you can profit with B&W Kaocrete-32 in electric furnace roofs, consult your B&W refractories representative or send for technical bulletin RR-46.

B&W REFRACTORIES PRODUCTS: B&W Allmul Firebrick
• B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick
• B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide
• B&W Ramming Mixes • B&W Kaowool

Circle 592 on Page 53

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

RR99

Circle 591 on Page 53

success
assured
. . . by Ansco

Regardless of the care taken during initial casting steps, perfection can never be guaranteed. But you can make sure that defective parts never reach your customer and injure your reputation.

Of course, gross imperfections are easily detected by routine X- or Gamma ray inspection. However, it takes the superior radiographic quality of Ansco X-ray films to detect minute flaws which many other materials miss. Ansco X-ray films offer maximum flexibility in all radiographic techniques plus uniformity from box to box. Insure your success by contacting your local Ansco representative. Ansco, Binghamton, N. Y., A Division of General Aniline and Film Corporation.

Ansco

Industrial X-ray

Circle 593 on Page 53

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- For further data on products described in the Equipment and Supplies section (Page 201)
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FOUNDRY — April 1959

401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
403	433	463	493	523	553	583	613	643	673	703	733	763	793	823	853
404	434	464	494	524	554	584	614	644	674	704	734	764	794	824	854
405	435	465	495	525	555	585	615	645	675	705	735	765	795	825	855
406	436	466	496	526	556	586	616	646	676	706	736	766	796	826	856
407	437	467	497	527	557	587	617	647	677	707	737	767	797	827	857
408	438	468	498	528	558	588	618	648	678	708	738	768	798	828	858
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411	441	471	501	531	561	591	621	651	681	711	741	771	801	831	861
412	442	472	502	532	562	592	622	652	682	712	742	772	802	832	862
413	443	473	503	533	563	593	623	653	683	713	743	773	803	833	863
414	444	474	504	534	564	594	624	654	684	714	744	774	804	834	864
415	445	475	505	535	565	595	625	655	685	715	745	775	805	835	865
416	446	476	506	536	566	596	626	656	686	716	746	776	806	836	866
417	447	477	507	537	567	597	627	657	687	717	747	777	807	837	867
418	448	478	508	538	568	598	628	658	688	718	748	778	808	838	868
419	449	479	509	539	569	599	629	659	689	719	749	779	809	839	869
420	450	480	510	540	570	600	630	660	690	720	750	780	810	840	870
421	451	481	511	541	571	601	631	661	691	721	751	781	811	841	871
422	452	482	512	542	572	602	632	662	692	722	752	782	812	842	872
423	453	483	513	543	573	603	633	663	693	723	753	783	813	843	873
424	454	484	514	544	574	604	634	664	694	724	754	784	814	844	874
425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
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425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
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Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed in the United States

—POSTAGE WILL BE PAID BY—

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Penton Building
Cleveland 13, Ohio

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FIRST CLASS
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CLEVELAND, OHIO

BUSINESS REPLY MAIL
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FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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A 3M Case History Report

DEBURRING-POLISHING TIME CUT 40% WITH "PG" WHEELS

CONTOUR POLISHING

MANUFACTURER: LeTourneau-Westinghouse Company

ADDRESS: Peoria, Illinois

PRODUCT MANUFACTURED: Earth Moving Equipment

3M ABRASIVE USED: "PG" Wheels

HOW 3M ABRASIVES ARE USED: "PG" Wheels used for contour polishing of air brake backing plate. Malleable cast-iron plate requires super-smooth finish on two concentric rings, to provide air-tight seal against neoprene air diaphragm.

OPERATIONAL DATA ON 3M METHOD: Two 1" x 10" "PG" Wheels, Grit #150 Three-M-ite Resinbond Cloth, mounted side-by-side on shop-made polishing shaft uniformly deburr and polish plate ring surfaces in 2-3 minutes.

OPERATIONAL DATA ON PREVIOUS METHOD: Overall deburring and polishing was by hand-rubbing with emery cloth. Time required was 4-6 minutes per plate.

PROVEN ADVANTAGES OF 3M METHOD: "PG" Wheel method, as opposed to hand finishing, allows more uniform finishing as abrading pressure can be more constantly applied with machine. Average time saving of 40% realized.

WANT MORE INFORMATION? Send for free manual, "Modern metal finishing with 3M 'PG' Wheels." Write to 3M Co., St. Paul 6, Minn., Dept. CN-49.

"PG" Wheels are manufactured in U.S.A by 3M Company, St. Paul 6, Minn. Export: 99 Park Avenue, New York. Canada: London, Ontario

WE RECOMMEND
How to use coated abrasives to cut costs . . . improve production. Shown in the new 426 page book
COATED ABRASIVES
MODERN TOOL OF INDUSTRY
At bookstores or McGraw-Hill, N. Y.

3M Coated Abrasives

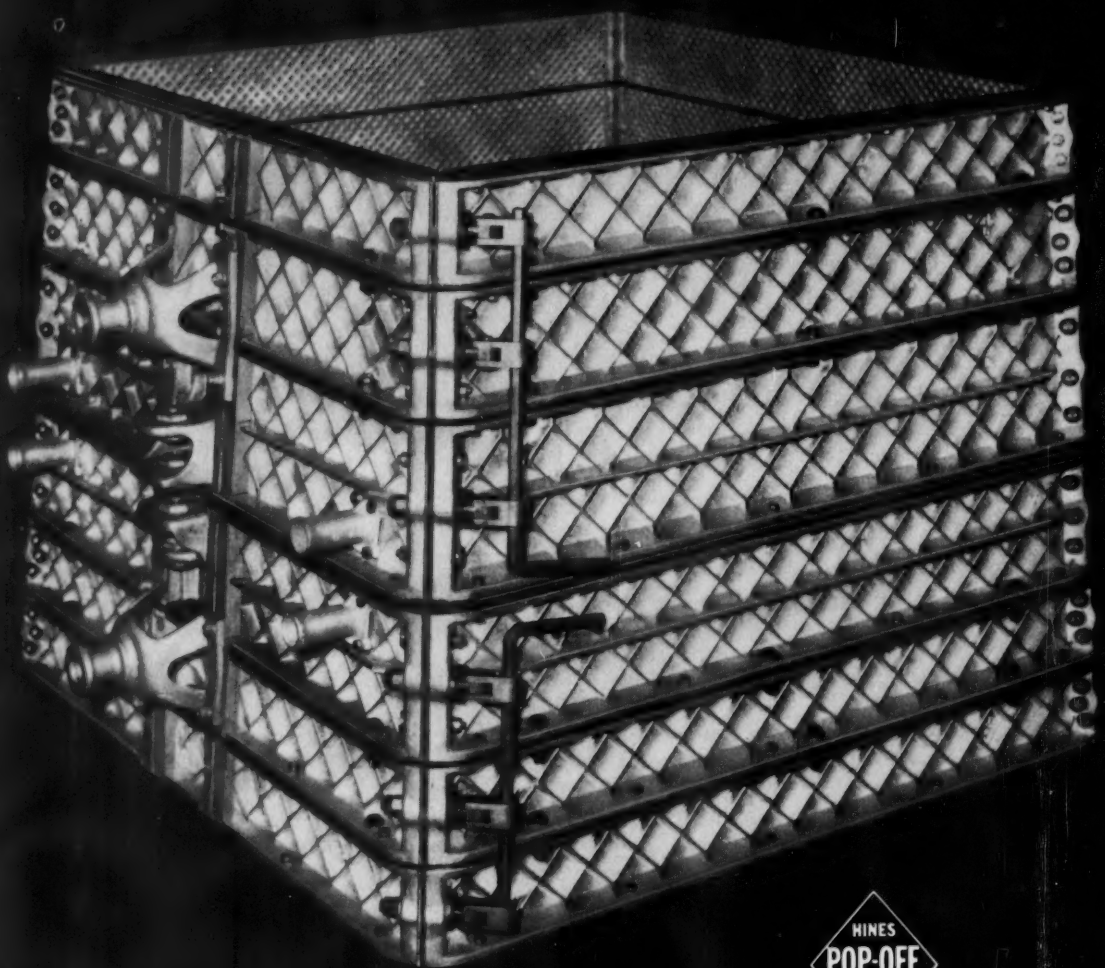
"PG" WHEELS

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

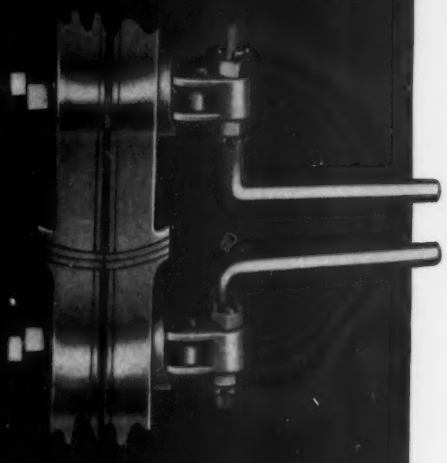
3M COMPANY

Circle 594 on Page 53



HINES
POP-OFF
FLASK
FEMA

Heavy-duty HINES "POP-OFF" flask, 36" x 36" x 34" high. 7" cope, plus 5" upset, plus 4" upset. 6" drag, plus two 4" upsets. Equipped with trunnions and handles.

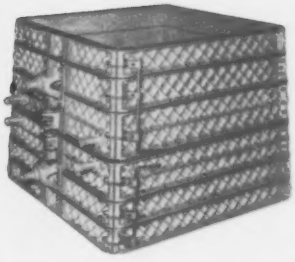


LOCKED POSITION

UNLOCKED POSITION

PATENTS PENDING

HINES FLASK CUTS 12 OPERATIONS DOWN TO ONLY 2!



This heavy-duty HINES flask, equipped with the new "POP-OFF" locking mechanism, really cuts down on flask removal time! If fitted with old-style individual levers for each section, six operations would be required to open each corner—twelve operations in all. Now, to open each corner, it's only necessary to grasp the two handles together, turn them 90° and all six sections are unlocked simultaneously! Only two operations to open the entire flask, quickly and smoothly.

This exclusive locking mechanism is available on all HINES "POP-OFF" flasks, to speed up the opening of any required number of flask sections. It eliminates strain usually exerted on flask and pins when each section is opened separately. Adjustment is easier, too, as nuts and lock nuts merely need to be taken up, to compensate for wear. Replacement of parts, if ever necessary, is a very simple matter.

Next time you're ready to buy flasks, be sure to consider these new, faster-acting HINES "POP-OFF" flasks — for better molds and better castings.

THE HINES FLASK CO.

3431 WEST 140TH STREET · CLEVELAND 11, OHIO

Circle 595 on Page 53

Keep high alloy melts CLEAN

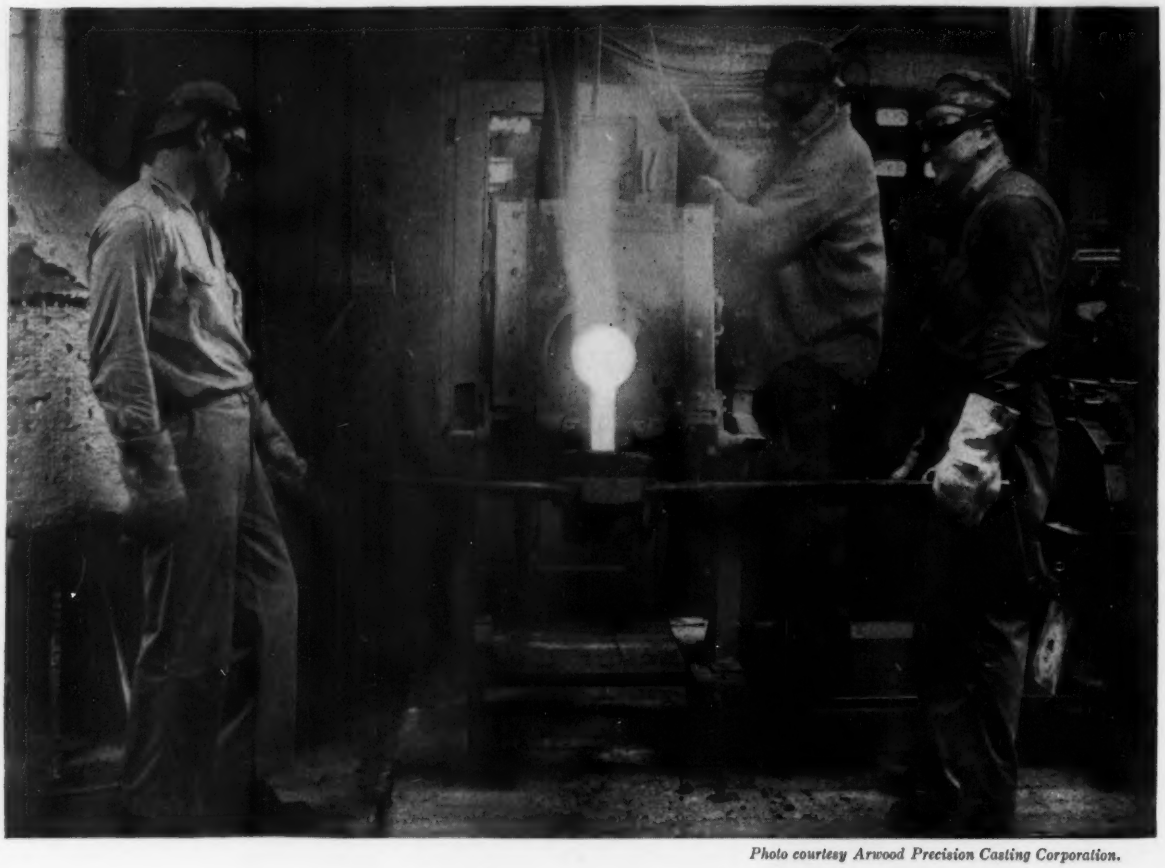


Photo courtesy Arwood Precision Casting Corporation.

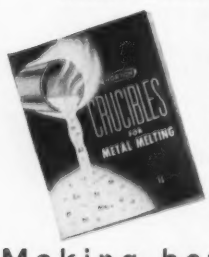
. . . with Norton Crucibles

You can pick the exact type of crucible you need for precision casting of high alloy steels from the wide NORTON line and have excellent protection against contamination.

No other crucibles give you such high stability to both heat and chemical action under a wide range of operating conditions. What's more, their fine, smooth surfaces are invaluable wherever molten metal must be kept free of refractory inclusions.

Specifically engineered for use in induction-type and indirect arc furnaces, these rugged NORTON Crucibles are ideal aids to critical casting techniques where both high precision and purity of the molded part are essential.

NORTON Crucibles can increase the precision, efficiency and economy of your casting operations. They're available in a wide variety of sizes. Get full details from your NORTON representative. And write for this new informative catalog on the *complete* line of NORTON Crucibles. NORTON COMPANY, Refractories Division, 303 New Bond Street, Worcester 6, Massachusetts.



*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

MAGNORITE* K Crucibles (97% Fused Magnesia)
Widely used for melting steels and ferrous alloys as well as cobalt, chrome, copper, bronzes and nickel.

MAGNORITE M Crucibles (99% Fused Magnesia)
Designed to meet refractory requirements calling for low boron, iron oxide, and silica content.

ALUNDUM* A Crucibles (99% Alumina)
Provide outstanding stability in both oxidizing and reducing atmospheres. Ideal for vacuum melting.

ZIRCONIA H Crucibles (Fused Stabilized Zirconia)
For operations where extremely high refractoriness and low thermal conductivity are required.

CRYSTOLON* Silicon Carbide Crucibles and other types of crucibles also available for melting nonferrous metals and alloys.

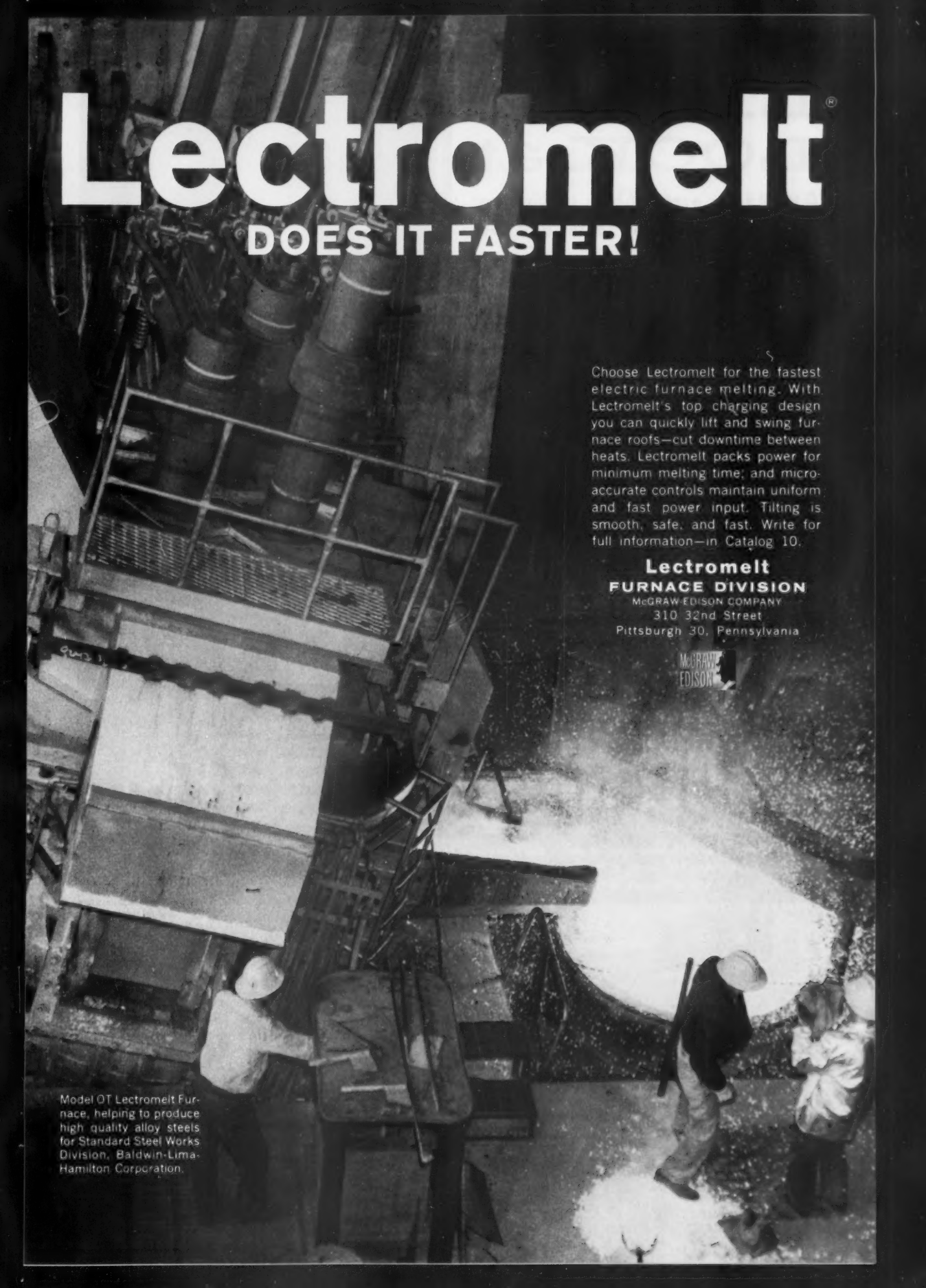
NORTON
REFRACTORIES
Engineered... Rx ...Prescribed

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

Circle 596 on Page 53

Circle 597 on Page 53→


Lectromelt®
DOES IT FASTER!
Choose Lectromelt for the fastest electric furnace melting. With Lectromelt's top charging design you can quickly lift and swing furnace roofs—cut downtime between heats. Lectromelt packs power for minimum melting time; and micro-accurate controls maintain uniform and fast power input. Tilting is smooth, safe, and fast. Write for full information—in Catalog 10.
Lectromelt
FURNACE DIVISION
McGRAW-EDISON COMPANY
310 32nd Street
Pittsburgh 30, Pennsylvania
McGRAW EDISON
Model OT Lectromelt Furnace, helping to produce high quality alloy steels for Standard Steel Works Division, Baldwin-Lima-Hamilton Corporation.

LET'S LOOK at

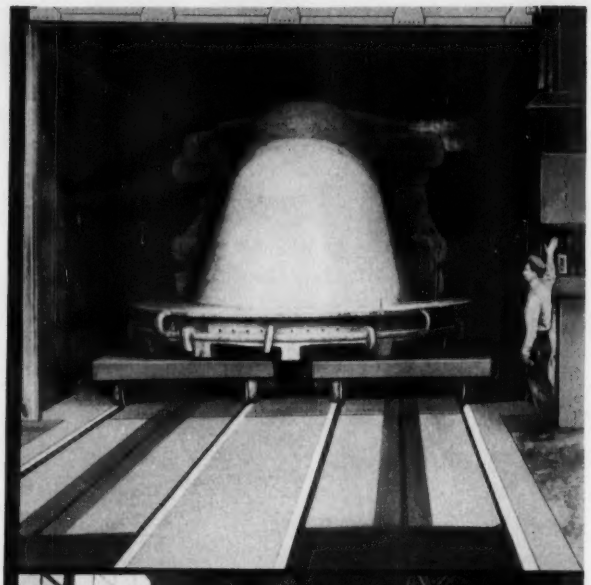
OVENS for every baking requirement

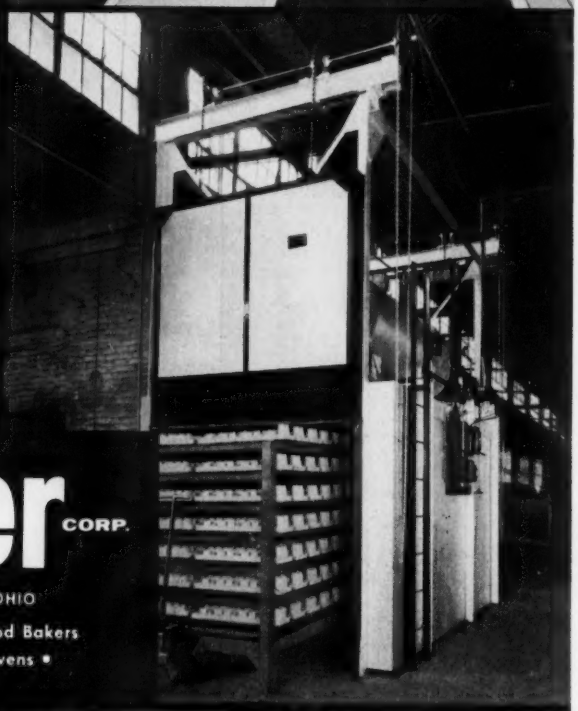
OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

Write for Bulletin 53-CM





TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

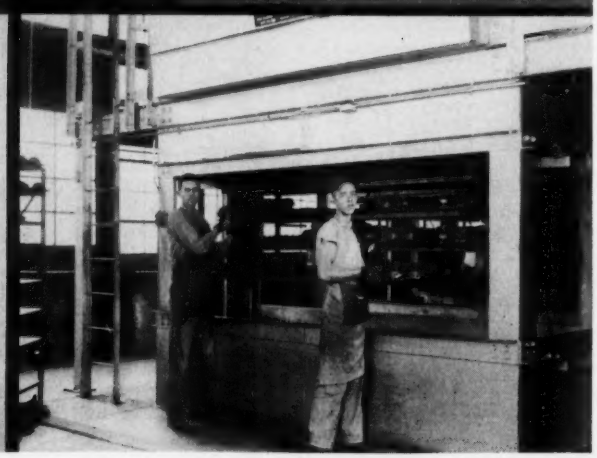
BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

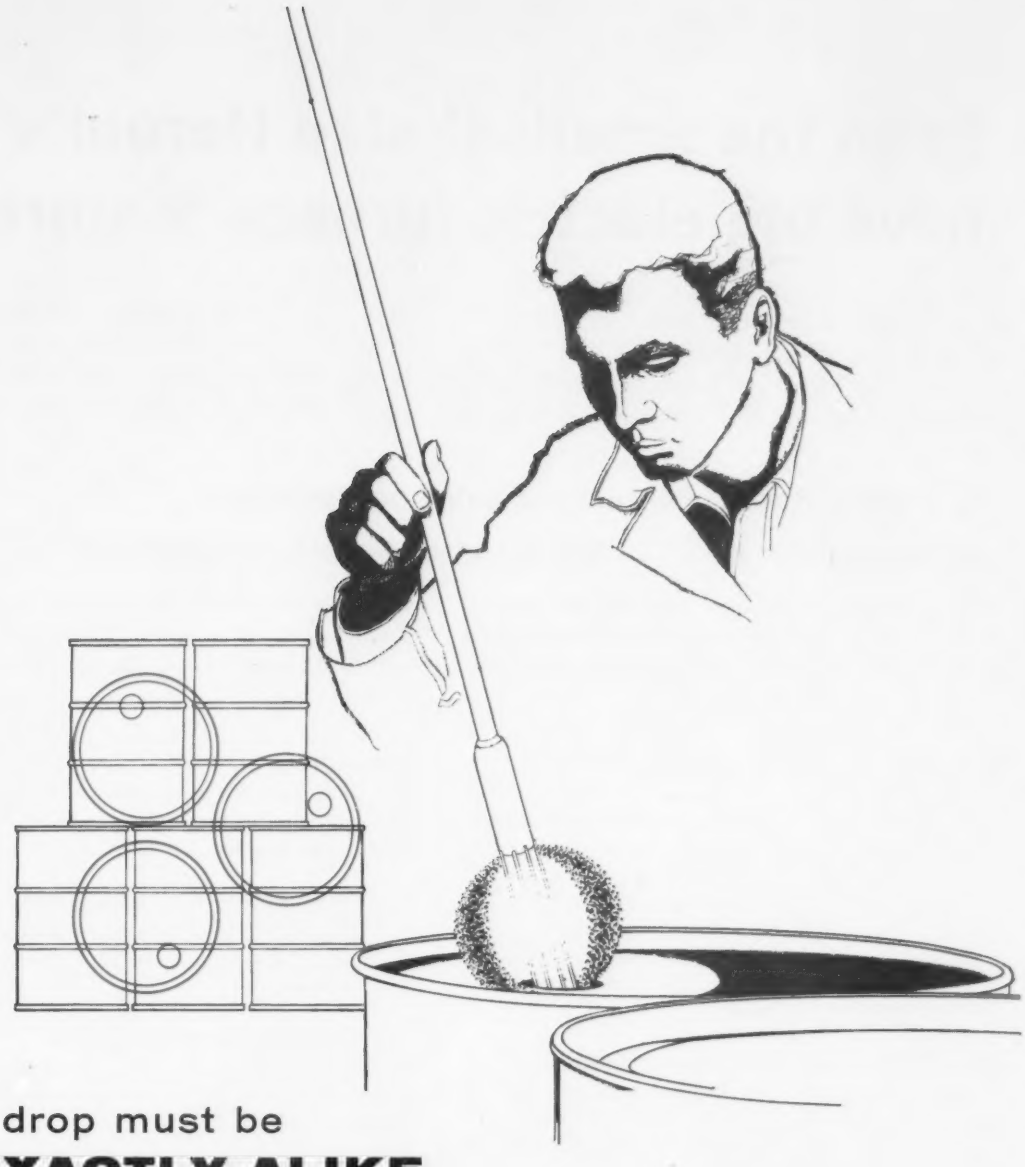
BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

THE **carl mayer** CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories





every drop must be

EXACTLY ALIKE

Consistent product uniformity is an enforced rule of procedure at THIEM — a company attitude. Every shipping drum is carefully checked with a depth light for dryness, freedom from scale, rust and alkalinity before it is filled with a Thiem product. Thus, you are doubly assured a Thiem core coating, oil, or thinner you use today will be just like the one you used yesterday and a year ago.

THIEM DISTRIBUTORS

Brumley-Donaldson Company
Los Angeles & Oakland, Calif.

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James Crain, Caseyville, Illinois

THIEM PRODUCTS INC.

MILWAUKEE 19, WISCONSIN

Manufacturers of foundry products exclusively

Circle 599 on Page 53

Even the smallest-size Heroults have big electric furnace features!

Now, while you've got time to catch your breath, is a good time to take a searching look at your foundry facilities. In the face of the obviously keener competitive period ahead, wouldn't you be smart to modernize your melting equipment—to switch to electric furnaces—and be ready for the business upturn that's coming? *You can install a Heroult now with minimum inconvenience to plant operations.*

The Heroult Electric Furnace helps you produce better-quality steel . . . faster . . . and more economically

Available in standard sizes of shell diameter ranging from 7′0″ on up, and with capacities of from 1½ tons up to 200 tons, the improved Heroult is unquestionably the finest electric melting furnace on the market. The features listed below are found in all standard Heroult's—even the smallest.

The Heroult Furnace is 100% mechanically operated.

It includes such mechanical features as: heavy rack-and-pinion-type tilting mechanism; mechanical roof lift; motor-driven, rotating, jib-type roof swing; winch-operated, water-cooled jib-type door-lifting mechanism; and high-speed, electro-mechanical electrode-positioning mechanism.

Another exclusive—cage-type shell construction with shell plates clipped to a heavy supporting structure. This construction minimizes shell warping and allows easy replacement if shell plates are damaged.

Exclusive—Operating Mechanism Independently Supported.

The tilting platform on which all operating mechanisms are supported is attached directly to the rockers independent of the shell structure. Thus operating mechanisms are unaffected by any shell distortion.

Exclusive—Flat-Bottom Shell.

This feature facilitates easy shell relining and provides maximum protection against burnouts. Thicker refractory at the sides of the hearth promotes more uniform bath temperature.

Exclusive—Water-Cooled, Skew-Back Roof Ring.

This feature eliminates the need for special skew-shaped roof refractories.

Electrode Mast Safety Device.

This spring-loaded, rack-and-pawl-type device provides positive protection against damage resulting from electrode-winch cable breakage.

Square-Sectioned, Water-Cooled Electrode Mast Arms.

This design guarantees a rigid connection between mast and mast arm, thus helping to maintain proper electrode position and alignment.

Remote-Controlled Electrode Clamps.

This device, of the spring-clamp, air-release type, is located inside of the rear section of the water-cooled mast arm where heat cannot affect it.

Square-Sectioned Electrode Mast.

This design feature, developed by American Bridge, assures proper guiding and electrode positioning.

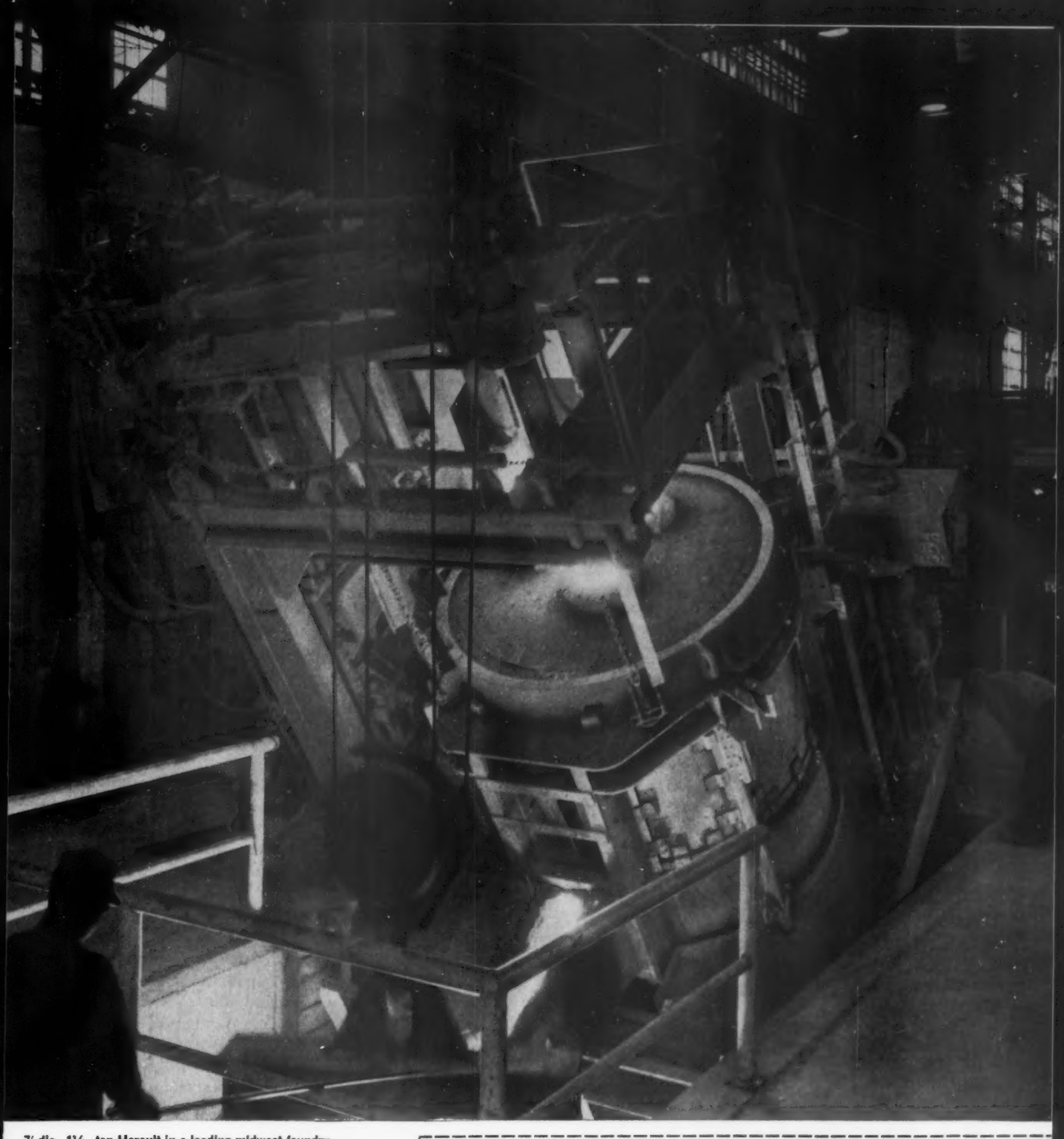
Rockers.

The heavy fabricated steel curved top and bottom rockers minimize forward travel during tilting. The furnace will return to charge position from any degree of tilt due to designed center of gravity.

USS, American and Heroult are registered trademarks

American Bridge Division of USS United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: New York, Philadelphia, Chicago, San Francisco, Harrisburg, Pa. and other principal cities
United States Steel Export Company, New York



7′ dia., 1½–ton Heroult in a leading midwest foundry.

Should You Put in an Electric?
Our 32-Page Catalog
Tells You Where and When!

Send for our free Heroult catalog for comprehensive information on the advantages of electric melting. Contains charts and tables; gives sizes, capacities, and ratings. Helps you determine how the Heroult can improve your operation. Just contact the nearest office or write direct to Pittsburgh.

Circle 600 on Page 53

American Bridge Division
525 William Penn Place, Dept. F-49
Pittsburgh 30, Pa.

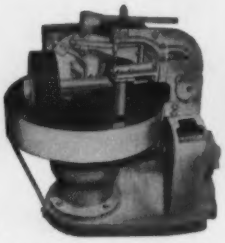
Please send me a copy of the latest Heroult Electric Furnace catalog ☐ and/or folder showing standard Heroult design features ☐.

Name ..... Title .....

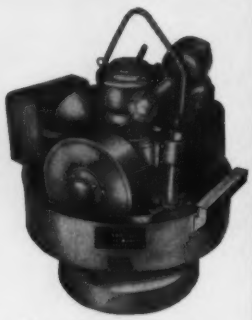
Firm Name .....

Address .....

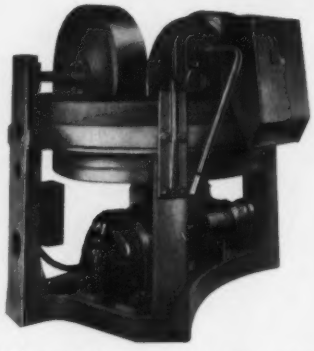
City ..... State .....



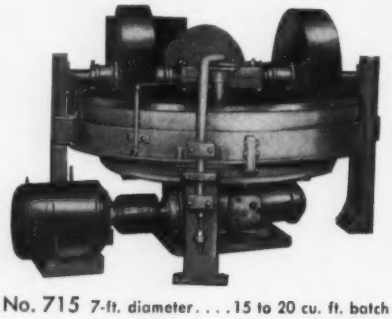
No. 251 2½-ft. diameter . . . . ½ to 1 cu. ft. batch



No. 414 4-ft. diameter . . . . . 2 to 4 cu. ft. batch



No. 610 6-ft. diameter. . . . 10 to 14 cu. ft. batch



No. 715 7-ft. diameter. . . . 15 to 20 cu. ft. batch

No. 930 9-ft. diameter. . . . 30 to 40 cu. ft. batch

ANY SIZE MADE TO YOUR SPECIFICATIONS

From compact portables to heavy-duty mullers

CLEARFIELD CAN SUPPLY THE RIGHT MIXER FOR YOUR JOB

Clearfield Mixers are available in capacities ranging from ½ to 40 cu. ft. . . . for batch or continuous mixing. They're constructed of rugged cast iron for strength, rigidity and wear resistance. And all Clearfield mixers feature the "revolving pan" mixing principle which keeps the material in *constant* state of violent motion; this eliminates the "lag" intervals which result in mixers with mullers and scrapers that revolve instead of the pan. With Clearfield revolving-pan mixers you get a constant controlled-course mixing action which assures a better balance of blending and tempering.

Whether you need a mixer for maintaining proper bond and moisture in heap sands . . . preparing facing sand or core sand for castings . . . or for any foundry application where sand control is important . . . Clearfield Mixers can do the job better, and save you production money.

Let us help you determine the best type and size for your particular needs. No obligation. Meanwhile, send for Catalog No. 90.

CLEARFIELD
MACHINE COMPANY
CLEARFIELD, PENNSYLVANIA, U.S.A.

Circle 601 on Page 53

...actually cost 50 to 75% less than regular fire clay brick!

Carbon CHEM-BRIX are produced to offer the foundry a refractory that will provide outstanding service at a low cost. In fact, service comparisons prove that CHEM-BRIX actually cost 50 to 75% less than regular fire clay brick. Ideal for the lining of all types of ladles, hot metal spouts, cupola wells, etc. CHEM-BRIX "shed" molten metal like oil sheds water . . . they offer a unique self-cleaning property and simplify skulling. Write today for complete information.

advantages

- Lasts 50 to 75% longer than fire clay brick
- 100% size uniformity insures tight joints
- Produces monolithic, self-cleaning surface
- Simplifies skulling

ILLINOIS CLAY PRODUCTS CO.

Main Office—Barber Building, Joliet, Illinois
Sales Office—208 South LaSalle Street, Chicago 4, Illinois

MANUFACTURERS OF: GOOSE LAKE Ladle Brick, Ground Fire Clay, Fire Clay Flour; GRUNDITE Bond Clay; FIROX; THERM-O-FLAKE Insulation Coating, Brick, L.B. Block, Concrete; CHEM-BRIX, Silica, Carbon

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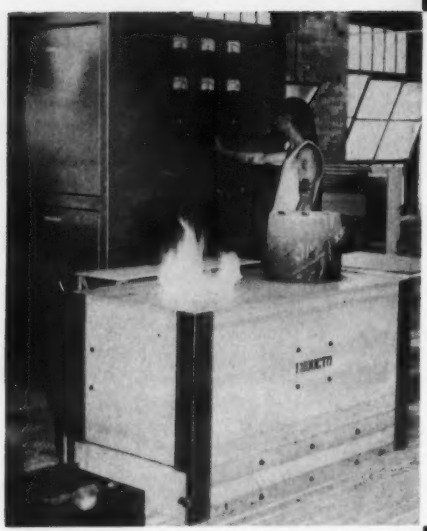


INDUCTOMELTING MEANS*

LOWER METAL LOSSES

Metal losses, as encountered in conventional melting practices, are reduced to insignificance by INDUCTOMELTING. The savings realized with Inducto melting equipment, though substantial in all metals, are particularly great in the easily oxidized or volatile alloying materials.

One non-ferrous foundry cut melting losses 80% through INDUCTOMELTING. This was made possible by higher melting speeds and the remelting of chips and turnings from machined castings which could not be done with the previous equipment without extremely high metal losses.

Why? Why should Inducto melting equipment provide such savings in metal? Because every component is designed and selected for the highest possible efficiency so that you can attain all the benefits of high-frequency induction melting at its best. With Inducto equipment, you get the highest possible melting speeds and the most accurate temperature control in the melting field today. Write for complete details—ask for Bulletin 70. Inductotherm Corporation, 412 Illinois Ave., Delanco, N. J.

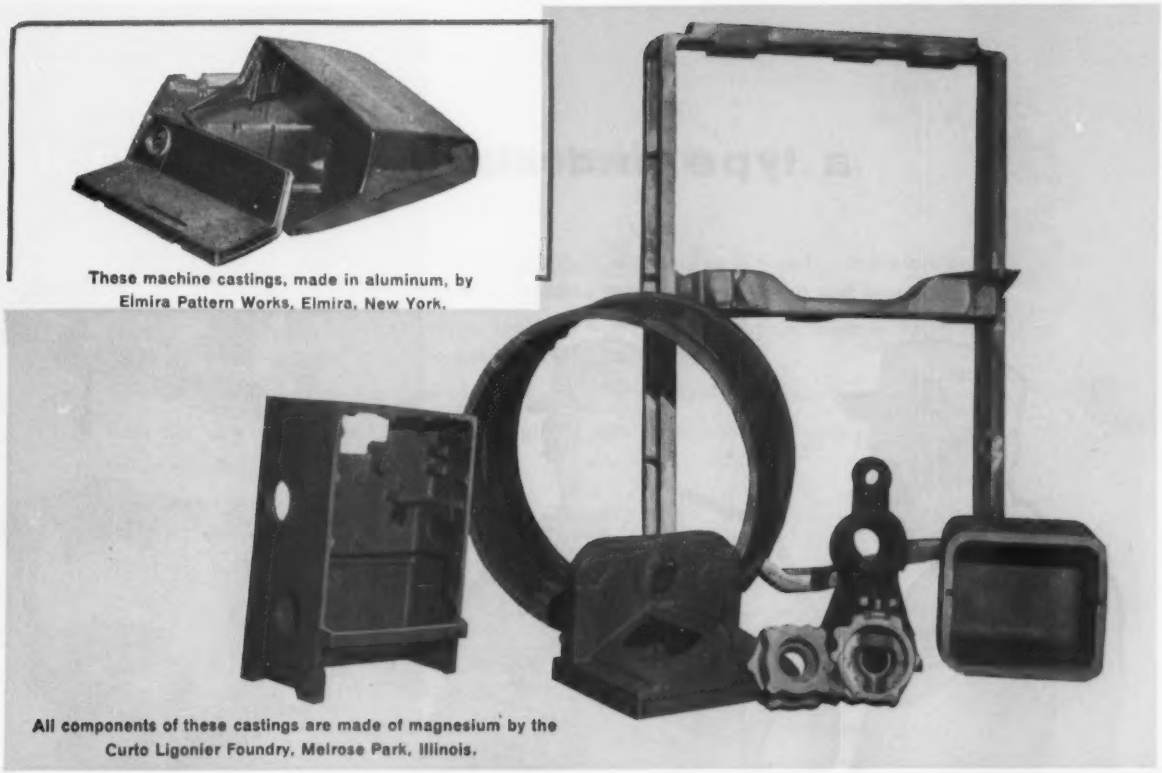
**INDUCTOMELTING is high-frequency induction melting PLUS the additional advantages of Inducto design features and engineering techniques.*

INDUCTOTHERM

INDUCTO ... the mark of modern melting

Circle 603 on Page 53

These machine castings, made in aluminum, by Elmira Pattern Works, Elmira, New York.



All components of these castings are made of magnesium by the Curto Ligonier Foundry, Melrose Park, Illinois.

For greater precision . . . in magnesium and aluminum castings . . . use PETRO BOND*

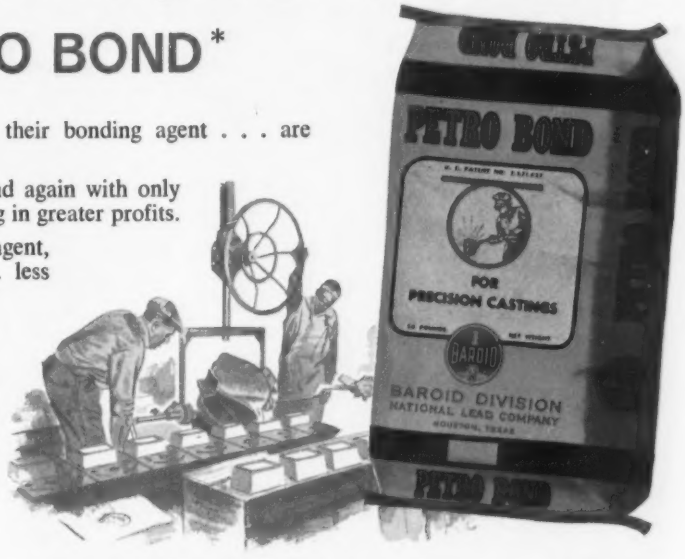
Foundrymen . . . using PETRO BOND as their bonding agent . . . are obtaining greater precision in their castings.

PETRO BOND SANDS are reusable again and again with only infrequent remulling and rebonding . . . resulting in greater profits.

PETRO BOND is a formulated bonding agent, bonding sand with *oil* instead of *water* . . . less gases formed . . . permits use of finer sands with lower permeability . . . gives a finer finish.

You can count on *precision castings* . . . using all ordinary foundry equipment when you use PETRO BOND!

*Registered Trademark of National Lead Co.



BAROID CHEMICALS, INC.

A SUBSIDIARY OF NATIONAL LEAD COMPANY

1809 SOUTH COAST LIFE BLDG. HOUSTON 2, TEXAS

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Alabama—Foundry Service Co., Birmingham. **California**—Independent Foundry Supply Co., Los Angeles—Industrial & Foundry Supply Co., Oakland 7. **Illinois**—American Steel & Supply Co., Chicago 28—Western Materials Co., Chicago 3—Mathens Company, Moline—John P. Moninger, Elmwood Park. **Indiana**—Steelman Sales Co., Munster. **Massachusetts**—Klien-Farris Co., Inc., Boston 11. **Michigan**—Foundries Materials Co., Coldwater—Foundries Materials Co., Detroit—Warner R. Thompson Co., Detroit. **Minnesota**—Smith-Sharpe Co., Minneapolis. **Missouri**—Walter A. Zeis, Webster Groves. **New Jersey**—Asbury Graphite Mills, Inc., Asbury. **New York**—Combined Supply & Equipment Co., Buffalo—Geo. W. Bryant Core Sands, Inc., McConnellsville. **Ohio**—The Buckeye Products Co., Cincinnati 16—The Hoffman Foundry Supply Co., Cleveland 13. **Oregon**—La Grand Industrial Supply Co., Portland 1. **Pennsylvania**—Pennsylvania Foundry Supply & Sand Co., Philadelphia 24. **Tennessee**—Robbins & Bohr, Chattanooga 2. **Virginia**—Asher-Moore Company, Richmond 25. **Washington**—Carl F. Miller & Co., Seattle 4—Pearson & Smith, Inc., Spokane. **Wisconsin**—Interstate Supply & Equipment Co., Milwaukee 4. **Canada**—Canadian Foundry Supplies & Equipment Ltd., Montreal 30, Quebec (Main Office) and Toronto 14, Ontario. 5951

a type and size molding machine
HERMAN PNEUMATIC MACHINE CO.
UNION BANK BUILDING, PITTSBURGH 22, PA.

for every foundry operation . . . .

Automatic . . . semi-automatic . . . push-button . . . standard . . . special. . . these are general ways to describe 15 specific, *different* types of molding machines we design and produce.

Our progressive development policy, together with the practical demands of foundrymen here and abroad, has resulted in this complete range of equipment.

It is a *fact* that we make a type and size molding machine for *every* foundry operation.

Perhaps, for example, our illustrated Charging Conveyor Machine fits your particular needs.

It *will*, if you want the following:

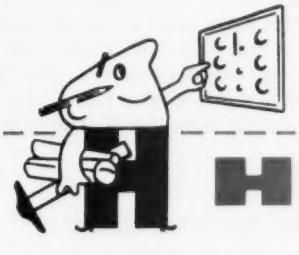
1. A machine to do short-run work.
2. Economical operating cost.
3. A high degree of flexibility.
4. Production of either cores or molds.
5. A molding machine manufactured in a wide range of 500 to 20,000 lb. rollover capacities.

Whatever you want in a molding machine, be sure to call in a Herman Sales Engineer.

Why not do it today?

HOW IT WORKS:

(a) Core box filled with sand and placed on the jolt unit.
(b) Power lift conveyor lowers box on sub-plate.
(c) Core box is jarred and elevated by power lift conveyor to a standard conveyor level.
(d) Box goes to Charging Conveyor Rollover and Draw Machine manually or by pusher mechanism.
(e) Pneumatic core box and core plate clamps engage rammed core box for rollover operation.
(f) After rollover, core clamps are disengaged and slow draw operation starts.
(g) Vibrators separate bond between core box and sand.
(h) Fast draw operation checked by speed control device, and core box gently deposited direct on discharge conveyor, then rolled away on companion conveyor.
(i) Inverted turnover plate and core box rolled back to upright position, pneumatic clamps disengaged, and box returned to either jolt station or storage.
(j) Another rammed core should, of course, now be at the Charging Conveyor Rollover and Draw Machine for the production of another core.



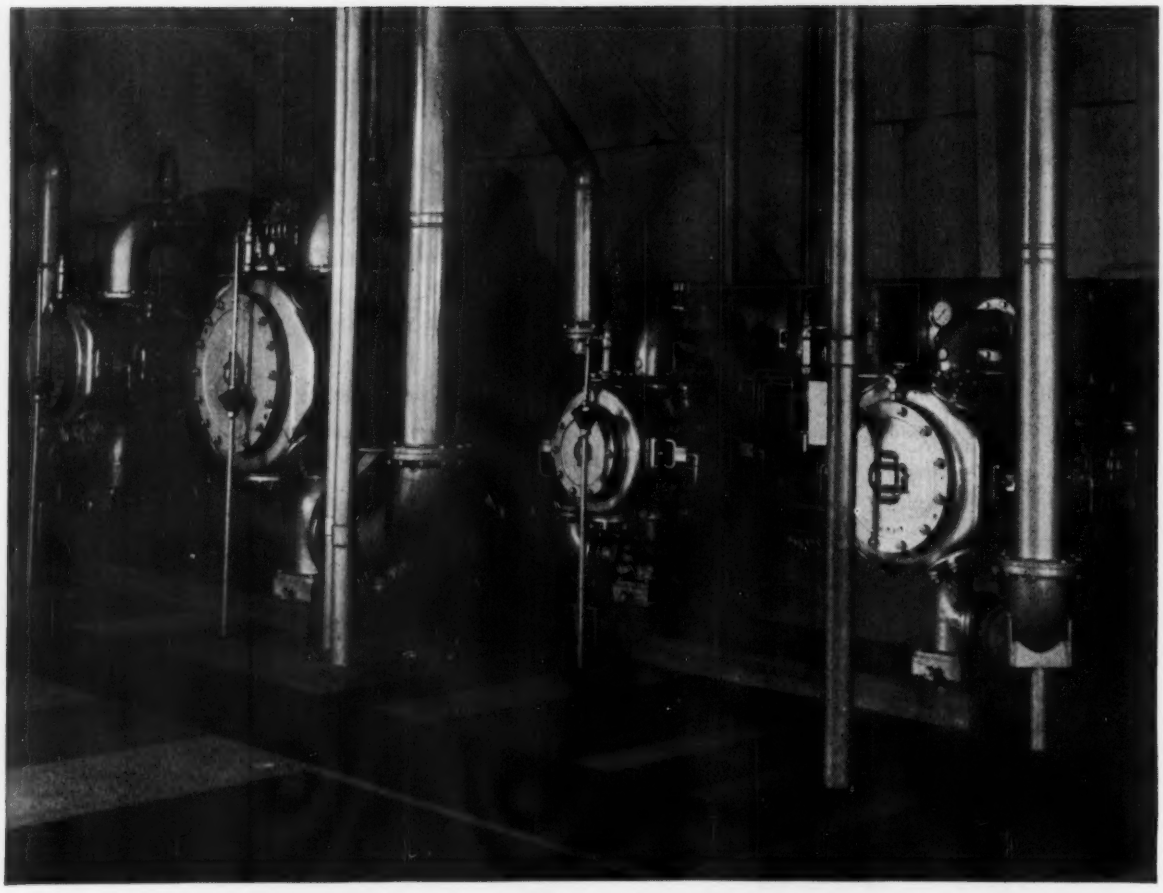
HERMAN

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

and most progressive

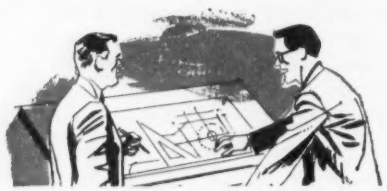
Best Known Name In Engineered Molding Machines

Circle 605 on Page 53



New Gardner-Denver HAF compressor (left) now supplies all air for a large plant. HAC (right) was retained as a stand-by unit.

How to modernize your plant with a planned compressed air system



IN INDUSTRY—SPEEDING THE PACE,

the Gardner-Denver specialist is an integral part of the team. He works side by side with engineers and designers, helping to solve their problems, for at Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

In a sweeping modernization of its compressed air system, a large Midwest foundry recently replaced several small, power-eating compressors with *one* large Gardner-Denver HAF. The new unit is 23 & 13½ x 14, delivering 1750 cfm. Now the plant has a *planned* compressed air system—resulting in considerable power saving, and efficient air flow throughout the plant.

Even though the new HAF supplies all the air for normal plant operations, a Gardner-Denver HAC with a capacity of 750 cfm was retained as a stand-by unit. Other steps in the modernization included installing a new air receiver and a new, larger 8" air line.

It'll pay you to take a close look at *your* compressed air. You may find modernization with a planned system a big cost-saver. A Gardner-Denver compressed air specialist will gladly look at your entire system—your compressor installation, your distribution system, your air uses and your maintenance of air tools. He can recommend the best solution to any compressed air problems you may have.

GARDNER-DENVER Since 1859 — 100 1959 YEARS

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Circle 606 on Page 53

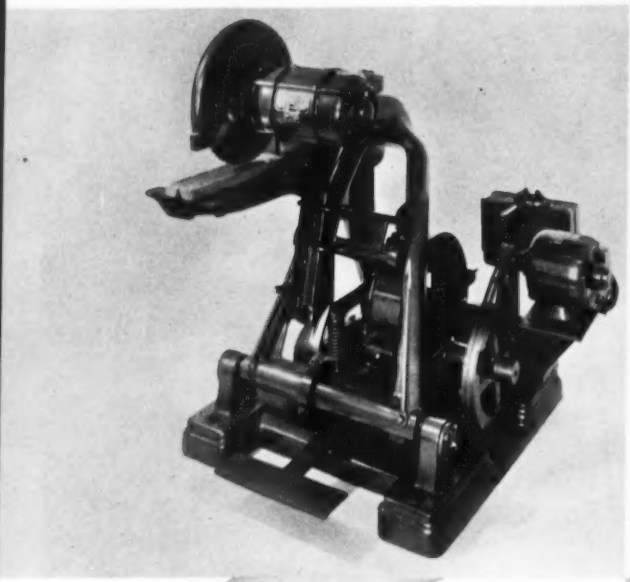
Circle 607 on Page 53→

"the fast way out of today's profit squeeze is through the use of more efficient materials which cost less to machine and fabricate, yet produce a better product..."
i.e. Federated Tenzaloy the high-strength aluminum alloy that needs no heat treatment

ASARCO

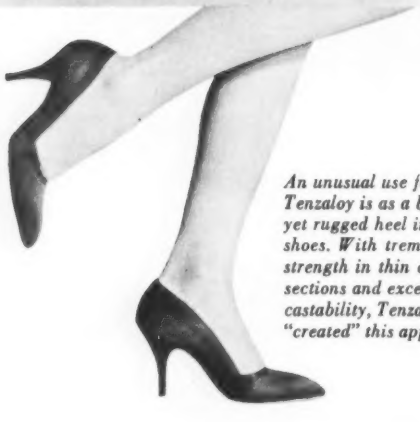
SEE NEXT PAGE

Federated TENZALOY



The vibration, strain, and abuse undergone by the movable arm of this cut-off saw calls for Tenzaloy, more and more the most qualified material for hard usage applications of this type.

Tenzaloy replaced a more expensive alloy in casting this airplane turntable when increasing size and weight of today's planes required a casting so large (4000 pounds!) that no heat treating equipment could handle it.



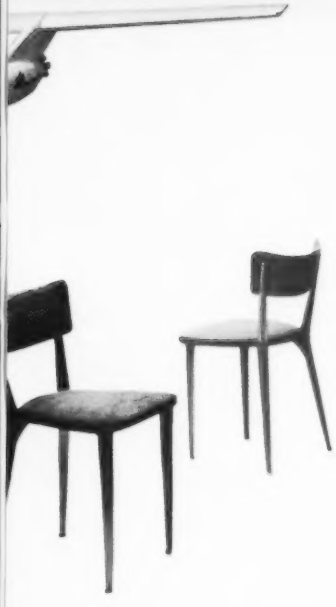
An unusual use for Tenzaloy is as a beautiful yet rugged heel in women's shoes. With tremendous strength in thin cross sections and excellent castability, Tenzaloy "created" this application!

Today's cooks choose shiny lightweight utensils cast in Tenzaloy over old style cast-iron pieces which often left ugly rust streaks. With corrosion-free Tenzaloy, there's no chance of contamination—ever!

Corrosion engineers expect these New York street signs to stay rust-free and shiny for years. In fact, they are unconditionally guaranteed maintenance-free for 15 years!

Tenzaloy contributes great strength in thin cross sections to these handsome modern chairs. Its castability in single-piece complex shapes, opens up wide new possibilities for the furniture designer.

he self-aging aluminum alloy gives you castings with greater strength–



Unlike heavy old-style fixtures, awning hardware cast in lightweight Tenzaloy defy rust and outdoor wear. No painting needed; the bright finish is permanent!

for less! Tenzaloy the self-aging aluminum alloy needs no heat treatment! If your aluminum castings are too large or too intricate for heat treatment, if your heat treating facilities are limited, if you need superior strength than you get from ordinary heat-treated alloy, specify "Federated Tenzaloy" developed by Federated to meet the need for a superior aluminum alloy that ages at room temperature. Tenzaloy eliminates rejects due to warpage, expansion, and internal stresses caused by quenching. Tenzaloy finished properties are stable, proved by conclusive test data over a ten-year period. No special foundry techniques are required. No fluxes. Castability is excellent with sand cast and plaster molds and many permanent molds. Tenzaloy will not "grow," produces corrosion-resistant castings with excellent polishing characteristics and anodizes clear white.

Specify Federated Tenzaloy for:

1. High "as cast" properties—no heat treatment required to get the properties of heat-treated castings.
2. High yield strength—Tenzaloy can be stressed beyond other high-strength, non-aging alloys.
3. Excellent ductility, particularly before aging—if it is desired to cold work or form castings, it should be done as soon as possible after casting, preferably within a day or so.
4. High impact and shock resistance.
5. Excellent machinability—better than the common aluminum-copper alloys. Machinability maximum after aging several weeks, or after artificial aging at 250°F. If machine operations are performed too soon after casting, some tendency to gumminess will be experienced.
6. Superior corrosion resistance—equivalent to the aluminum-silicon alloys.
7. Excellent polishing characteristics—will produce silvery-white castings that take a high polish.
8. Takes a white anodized finish—castings can be dyed all available colors; porosity-free surfaces are essential for satisfactorily utilizing current commercial dyeing procedures.
9. No special foundry technique required—handles like any other aluminum alloy. Heat to required temperature, skim and cast. Magnesium additions normally not required.
10. Good castability—produces sharp impressions, clean castings.
11. Permanent molds can be used—thin-walled, restrained, intricate shapes should be avoided.
12. Plaster molds can be used—properties superior to other aluminum alloys will be obtained. Excellent castability.
13. No fluxes needed—skimming alone is sufficient. A flux may be used to assist in dross removal where necessary. All stirring and excessive turbulence during pouring should be avoided.
14. Dimensionally stable—Tenzaloy does not grow as do other aluminum alloys containing copper and silicon as major alloying elements.
15. Internal stresses normally found in high-strength heat-treated castings are not present because quenching is not required.
16. Can be brazed by standard techniques used for wrought alloys; oven or flux-dip method.

COMPOSITION AND COVERING SPECIFICATIONS

The nominal composition of Tenzaloy is: Copper—0.8%, Zinc—8.0%, Magnesium—0.4%, Aluminum—balance.

Tenzaloy is covered by SAE 315, ASTM Specifications B179-58 alloy ZC81A-B for Ingot; B108-58T alloy ZC81B for Permanent Mold: and B26-58T alloy ZC81A for Sand Casting. Tenzaloy is covered in Government Specifications by MIL-A-17129 (Ships) Class 8, MIL-A-12033 (ORD) alloy ZC81A, and Federal Specification QQ-A-6016 Class 22M.

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

Ready to talk TENZALOY?

(or about any one of the many others of Federated Metals' complete line of aluminum casting alloys)

Write for Tenzaloy Bulletin No. 103, Aluminum Casting Alloys Handbook Bulletin No. 101. Federated Metals Division, 120 Broadway, New York 5. Or the Federated Sales Office, or plant near you

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Alton Phone: Alton 5-2511
St. Louis phone: Jackson 4-4040

BALTIMORE 24, MARYLAND
Highland & Eastbourne Aves.
Phone: Orleans 5-2400

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416 Dalton Drive
Phone: Fairfax 2-1802

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Phone: Liberty 2-0797

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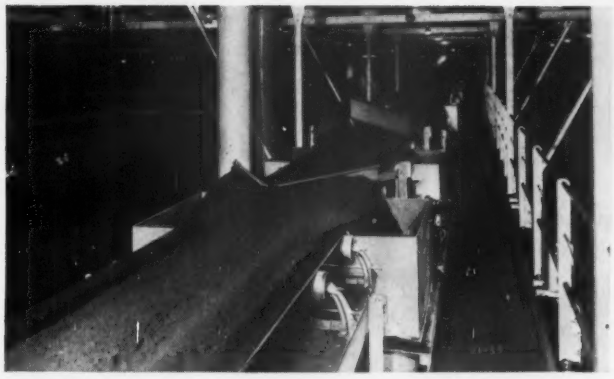
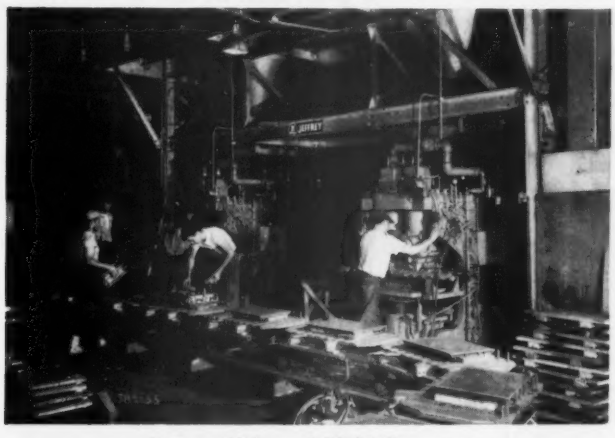
ASARCO



Jeffrey Sand Handling Belt Conveyor with Automatic Plows



Jeffrey Universal Mold Conveyor

Jeffrey Universal Mold Conveyor, Automatic Mold Dumper and Apron Conveyor

Jeffrey Apron Conveyor Handling Castings

you'll see the difference in foundries planned by **JEFFREY**

MECHANIZATION takes over many operations formerly requiring manpower—from sand preparation and distribution to the molders and core makers, to the pouring positions and shakeouts, then back to sand reclaiming and storage—moving raw materials and processing finished castings. Jeffrey services to the foundry industry are that complete.

We'll start with a survey, prepare layouts and recommend equipment, build and install a system to suit your exact requirements. We'll alter existing facilities or replace obsolete units with modern, efficient Jeffrey machinery.

Catalog 911 describes these services and equipment. For a copy, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

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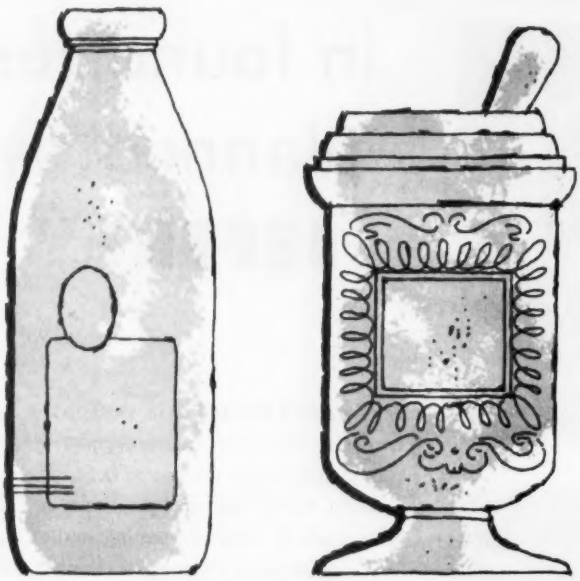
Circle 608 on Page 53

International Minerals & Chemicals

A REPORT TO FOUNDRIES

FROM TOM BARLOW

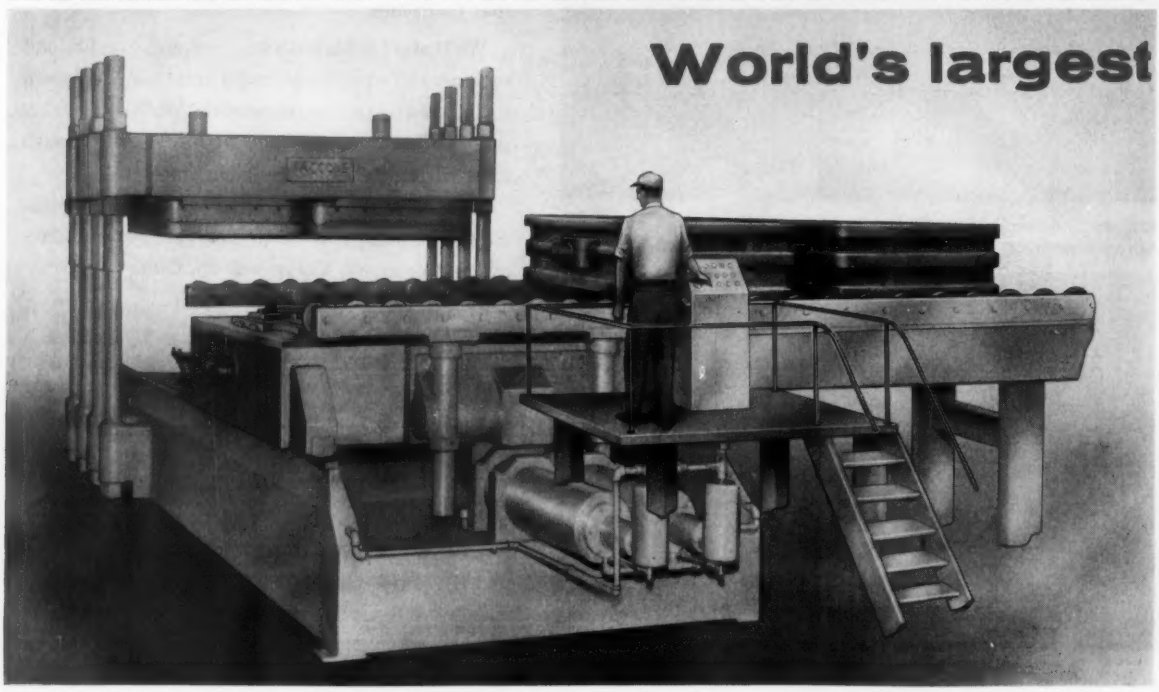
Food or medicine?



A ghost must be laid to rest. The industry has been haunted too long by the misconception that additives are either "cure-alls" or "medicine" — and neither expression is used in a flattering way.

Although in the last "Report to Foundries" I promised (or threatened) to clarify the differences between our five flowability additives — that will have to wait. "Know first the father, if you will try to understand the child." So let's look at the clays first.

To save space (which costs money), we won't re-hash everything said in the last "Report" about the differences between *Revivo Bond, Black Hills Bentonite*



and *Dixie Bond.* If you missed that issue, let me know and I'll send you a reprint (Note: We have ordered 1000 extra reprints per month to meet the increasing demand.)

Our sermon today applies equally to all three clays and therefore, to every practice—including yours. Although it is a general discussion and cannot be universally applied, it will stand up in most cases.

In brief (and within reason), the more clay or the stronger the sand, the better. (High strength is more than 14 psi; low strength is generally below 10 psi. In between are the middle-of-the-roaders or special cases.) The merits of high-strength sands are meeting wider acceptance now — for which Eastern Clay Products is grateful. More and more, the following truths appear in print:

1. High-strength sands give higher mold hardness.

2. Cuts, washes, rat-tails and scabs are reduced by increasing clay (at temper, of course).

3. High-strength sands *improve* finish.

4. High-strength sands require less combustible material.

5. At proper temper, high-strength sands produce castings closer to proper weight and dimensions.

6. High-strength sands provide for less metal penetration and mold-wall movement.

7. Tempered to equal deformation, a high-strength sand may show *higher* flowability.

What has this to do with additives? Simply this. Weak sands may need additives to cure their basic faults, but this is not the only use of an additive. Furthermore, using additives to overcome the weakness of low clay is not economical practice. Startling or otherwise, high-strength sands require less additives than weak sands. And when used with such sands, the purpose of the additive can hardly be described as "medicine."

Let's try a medical comparison. A healthy adult requires less than five mg of Vitamin B_1 per day to stay "bright-eyed and bushy-tailed." This may be obtained from the normal diet or supplemented by pills. In either case, the B_1 is a basic food requirement of the human body. But to cure a bad hang-over, a doctor may give 20,000 units of B_1 — about an 11-year supply at typical food levels. So the same substance is either a food or a medicine, depending on the condition of the user.

By the same token, the user of high-strength green sand uses additives to keep his daily cast "bright-eyed and bushy-tailed." They help him make better looking, more saleable castings . . . keep his scrap and overall costs to a minimum. He ships castings that are close to dimension and proper weight. And, everything else being equal, he makes more money.

In our future discussions of additives, we will stress this "food" approach. Our angle? That's easy. We know our future lies in the future success of our customers. We want to help you *sell* more castings by making better ones at lower cost through improved practice. Our policy: to charge only for our product but to deliver "product plus" —

- plus service
- plus research
- plus know-how
- plus impartial help on sand problems

Please let us know when and how we can be of help. Drop a line, or give us a call.

high pressure molding machine

"Give us a flask large enough and we'll squeeze a pattern as big as a battleship." That's the word from Taccone Pneumatic Equipment Co., where the largest high-pressure molding machine was designed and built for pipe fittings and cast iron boiler systems.

Heard the facts about the uniform molds, elimination of ram-offs and long list of cost savings offered in these machines? Write—we'll be glad to go into detail.

VITAL STATISTICS

Squeeze pressure at 80# line	672,000#
Actual squeeze time for ramming a mold with 7000# of sand	6 seconds
Flask size	84" x 84" x 16" (or 2 flasks 42" x 84" x 16")
Line pressure	80 to 100 psi
Total squeeze pressure at 100# line pressure	705,600#

Creators of Living Minerals

EASTERN CLAY PRODUCTS DEPT.

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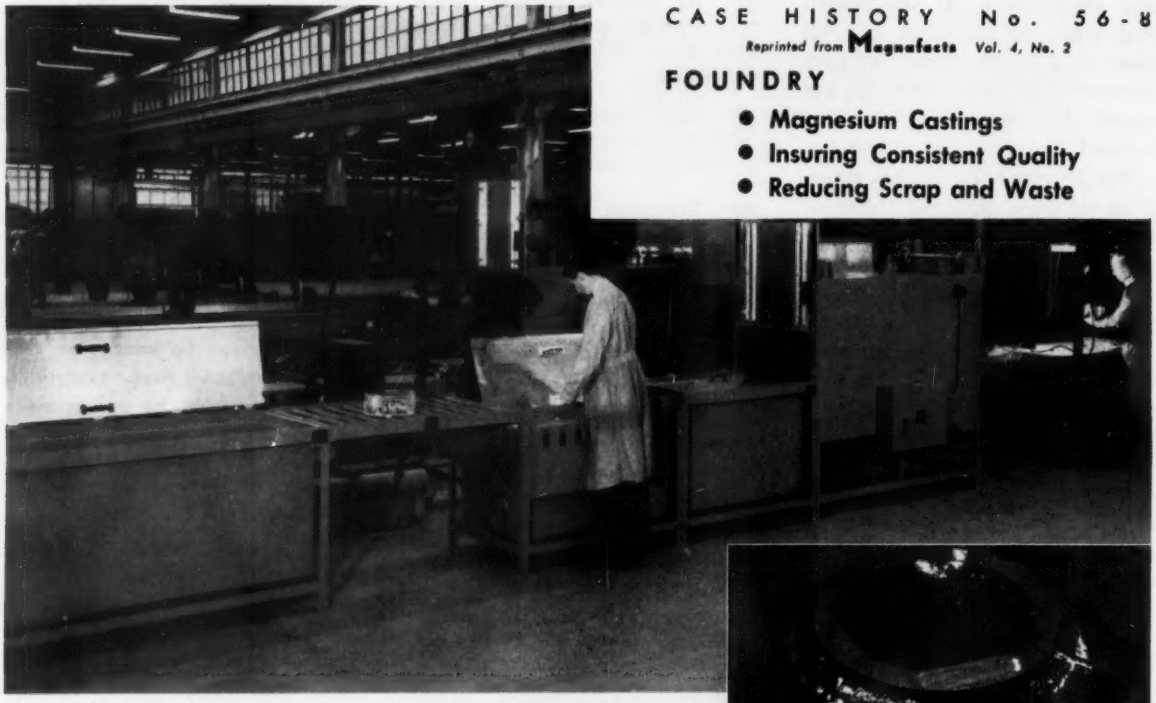
21-59

CASE HISTORY No. 56-8

Reprinted from Magnafacts Vol. 4, No. 2

FOUNDRY

- Magnesium Castings
- Insuring Consistent Quality
- Reducing Scrap and Waste



Through this Type ZA-29 Zyglo Unit, parts flow in a 5-step inspection, beginning with application of penetrant at extreme left, and ending with inspection under black light at the right.

Shrinkage porosity in a magnesium casting as revealed by Zyglo. Finding the cause helps provide the cure.

Inspection Pays Off in Consistent Quality of Magnesium Castings

Magnaflux' Zyglo Also Reduces Scrap and Waste at the Magnesium Alloy Products Co.

If a typical, progressive foundryman could hang just one motto on the wall, it would probably be, "Aim for *Consistent* Quality". He doesn't mean "perfection" — he means that every casting produced should be job-worthy for its purpose.

The Magnesium Alloy Products Co., of Compton, California, is a good example of what such an aim can accomplish. Through modern processes and a well planned inspection system centering around Zyglo Fluorescent Penetrant Inspection, it has achieved high consistent quality, while reducing scrap losses and waste.

"To prevent excessive scrap from occurring," explains L. M. Nash, Metallurgist for the company, "it is necessary for the inspection department to catch a faulty casting as soon as possible—first, to isolate it so that no further labor or time will be wasted on it; and second so that the quality control department can make corrections before too many castings are poured.

"An average molder with an average squeezer pattern will produce about six molds an hour. The pouring, cooling and shakeout will require about 30 minutes, so that by the time the first casting reaches the first or 'hot inspection' there are probably four to six molds already made.

"If this casting contains a flaw that is not seen by the inspector, it may be several hours before the trouble is found at a later inspection point. It is therefore vitally important that the inspection department be given every facility needed to locate trouble spots as soon as possible.

"The defects we look for with fluorescent penetrant inspection are cold shuts, cracks, blows, shrinkage, and dross.

"Zyglo inspection has many advantages to fit our inspection needs at Magnesium Alloy Products Co. The cost of material used per casting is low and the process fast enough to keep up with production and give us quick and accurate answers. And there is no objectionable residue left on the castings to interfere with subsequent operations.

"The final big advantage to us, of course, is that besides reducing scrap, lost time and waste, we are now able to turn out a better quality casting."

FOR YOU, *TOO—Magnaflux Test Systems can help to increase the yield of usable castings — and foundry profits! See your MX Engineer or write for details*

THE HALLMARK OF QUALITY IN NONDESTRUCTIVE TEST SYSTEMS

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INTERNATIONAL AUTOMATION CORPORATION 121 HURON VIEW BLVD., ANN ARBOR, MICH.

The new Buhrer sand cooler will give you:

IMPROVED CASTING QUALITY

A clean pattern draw is obtained even with minimum draft angles. The sticking of the sand to the pattern plate, and the resulting casting defects are eliminated. Casting defects resulting from cold cores placed into hot molds disappear completely.

HIGHEST MULLING EFFICIENCY

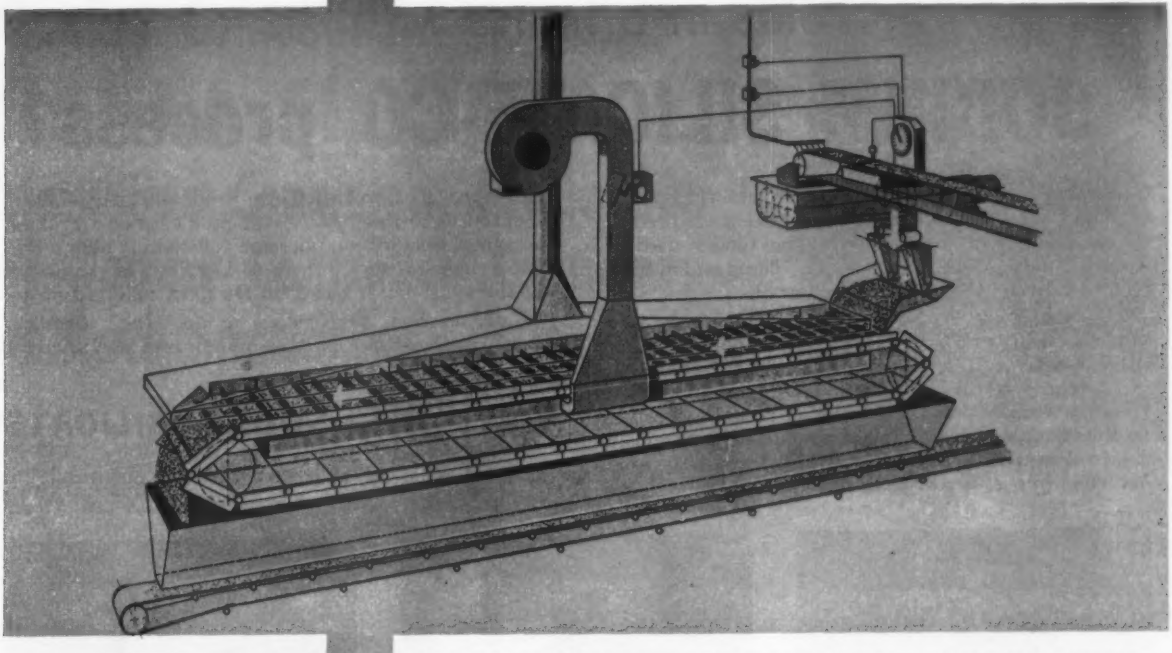
Practically all "live bond" contained in the return sand remains available for re-bonding purposes. In addition, cool sand requires less bond with mixing time reduced. The use of cool sand at controlled low temperature and moisture is a prerequisite for automating the mulling cycle.

BEST POSSIBLE CONTROL OF SAND PROPERTIES

The use of a cool sand in the muller results in consistently accurate batch volume; no condensation, therefore, no build-up in muller or weighing device. The re-conditioned sand reaches the molding stations in the same controlled condition, because evaporation losses of the sand between mill and molding stations are kept at an absolute minimum.

HIGHEST RECLAMATION YIELD

No "fines", therefore, no reusable binders are lost. The "BUHRER" COOLER cools the hot sand immediately after shake-out. The return sand reaches the reconditioning equipment in a "screenable" condition at controlled low temperature and moisture.



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Gentlemen: Please send me, without any obligation, a free copy of your bulletin SC-80.

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High-speed Sodium Silicate-CO_2 process is used for making molds for hangar-door counterweights at St. Paul Foundry and Manufacturing Co., St. Paul, Minn. In this "book" molding operation, 30 parts are made with one pour in clamping jacket (*above right*).

These 4 men make 680 rigid, accurate molds in 6 hours with the

SODIUM SILICATE-CO_2 process

Greatly increased production of grey iron castings at the St. Paul Foundry and Manufacturing Co. is credited to the sodium silicate-CO_2 process. The binder used is Archer-Daniels-Midland's "Adcosil," based on Du Pont Sodium Silicate; CO_2 is the curing agent.

Curing takes so little time that 4 men turn out 680 accurate molds in 6 hours for 20 tons of poured metal! Other processes—like green-sand molding—require up to 12 men, yet still can't match CO_2 output. St. Paul Foundry workers prefer CO_2 molding because there are no objectionable fumes. Management likes the extremely close tolerances of the molds—possible because the sand hardens while in *direct contact with the pattern.*

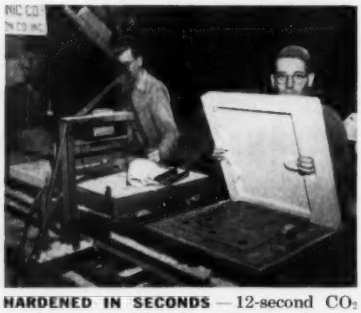
Perhaps your operation can profit with the sodium silicate-CO_2 process, just as the St. Paul Foundry does. Ask your foundry supplier for full details about this timesaving process, or write to Du Pont for names of suppliers of binders based on Du Pont sodium silicate.

E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Dept., Rm. N-2533, Wilmington 98, Delaware.

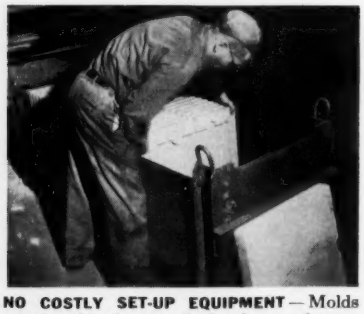
DU PONT REG. U.S. PAT. OFF. **SODIUM SILICATE**

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

CORE BLOWER forces sand into pattern mold, forming an exact duplicate. St. Paul uses mixture of sand and "Adcosil," a binder made by Archer-Daniels-Midland, Cleveland, Ohio.



HARDENED IN SECONDS—12-second CO_2 gassing reacts with sodium silicate to harden mold while still in pattern. Cured mold won't crack when lifted, is rigid enough to stand on edge without damage.



NO COSTLY SET-UP EQUIPMENT—Molds are placed in clamping jacket for metal pouring. Castings cool overnight. Next morning "books" are shaken out, and jackets made ready for next pouring.

Accurate casting of this 40-lb. rear end housing cuts machining at Auto Specialties.

Quality Controlled HANNA SILVERY... Simplifies Consistent Production of Quality Controlled Castings at Auto Specialties

Much of Auto Specialties Manufacturing Company's fine reputation has been built on the high quality malleable castings produced in huge quantities at its St. Joseph, Michigan, foundry. An important factor in this continuous high quality story is the use of Hanna Silvery. Its dependable analysis plays a major role in the close silicon control of cupola-electric furnace duplexing of malleable, so necessary in the manufacture of precision automotive parts.

Whether they are housings or gears, sprockets, universal joints or clutch plates, quality controlled Hanna Silvery is of vital assistance in maintaining the exacting chemical composition necessary to production of precision castings time after time. This record is substantiated by a million-volt X-ray machine, a part of Auto Specialties quality control system, which spot checks castings for uniformity and accuracy.

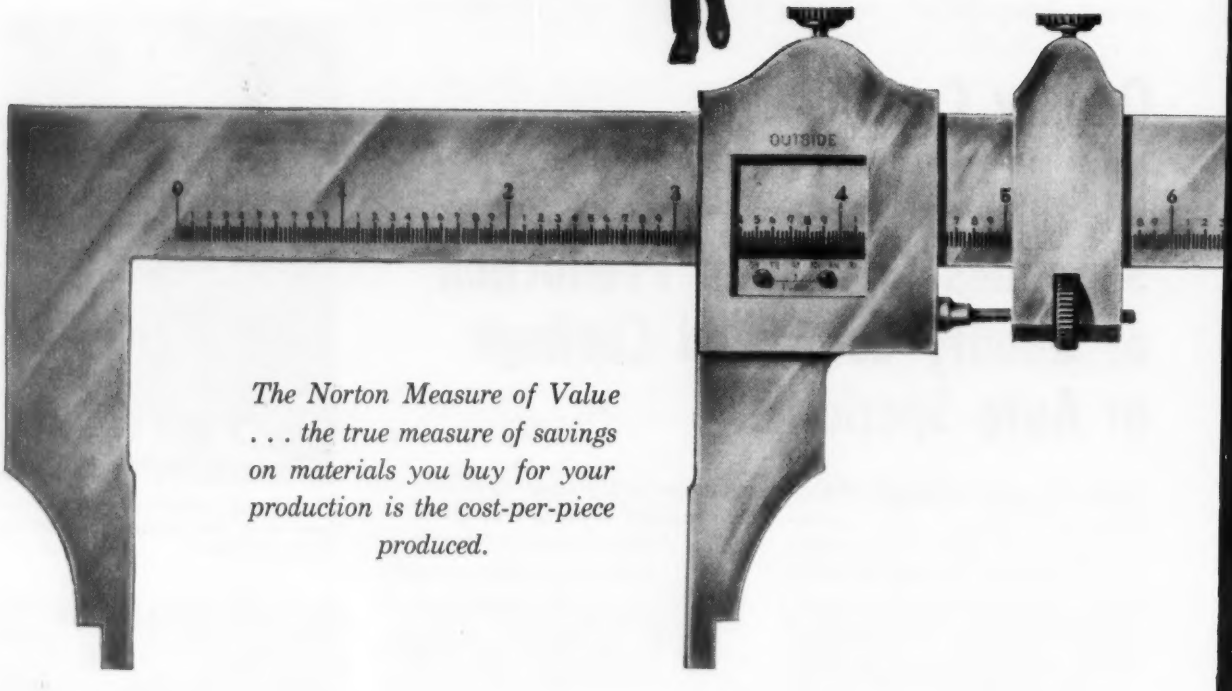
Hanna produces high quality pig iron for every foundry need. All regular grades, plus close-grain HannaTite, are available in 38-pound pigs and HannaTen ingots. Trained representatives are ready to help with your metallurgical problems. For assistance, call Hanna today.

Millions of perfect castings at Auto Specialties pass under the eye of this X-ray machine.

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

Circle 613 on Page 53

Call your Norton Man — he has the experience, the products, and knows how to save you money where it counts. There's a Norton expert in the fields of — abrasives, grinding machines, refractories.



The Norton Measure of Value . . . the true measure of savings on materials you buy for your production is the cost-per-piece produced.

Economists could argue the definition of the value of a grinding wheel in many ways. But it would usually come down to this — What is it worth to the purchaser.

You can buy less expensive grinding wheels than Norton wheels and save on immediate cost. But if the lower cost wheels do not perform their jobs efficiently or cause production delays because of poor quality or wheel misapplication — you haven't made a bargain — you've made a costly mistake.

The only accurate measure of the value of a grinding wheel is how much it produces for you per dollar cost — not merely how much you paid for it. Here is why Norton grinding wheels are worth more to you —

Norton Company gives you the most advanced research engineering and manufacturing facilities in the entire abrasive field — and you get this great scope of detailed knowledge on a personal basis — your Norton Man.

Every Norton Man starts his career by spending a minimum of one year in a carefully planned training course in the Norton plant and a comparable period of training in the field to assure a broad, thorough understanding of grinding before he goes "on his own." The average experience of all Norton Men in the field is 15 years in addition to their specialized training. The Norton Man is the most knowledgeable man in abrasives that you can consult. Make him your consulting abrasive engineer.

He will make an Abrasive Requirement Study for you.

You can produce greater savings than you can buy

This study lists the correct specifications for each abrasive job in your plant to assure you lowest cost-per-piece produced. He is also available for complete field testing on specific problems.

For example, your Norton Man can increase production by pointing out ways for better wheel usage and fewer wheel changes. He has the widest selection of grinding wheels in the industry from which to select the best wheel for new product grinding operations and for improving your current grinding jobs — both at the lowest cost. And with Norton grinding wheels you can be sure of precise duplication order after order.

Norton offers true abrasive economy. Economy that pays off in lower cost-per-piece produced. Call your Norton Man. NORTON COMPANY, General Offices, Worcester 6, Mass.

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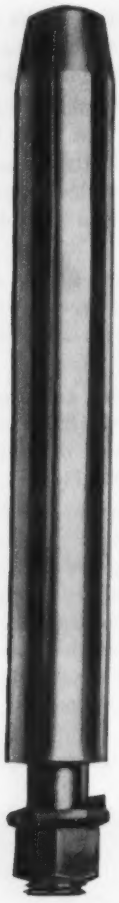
NORTON

ABRASIVES

Making better products . . .
to make your products better

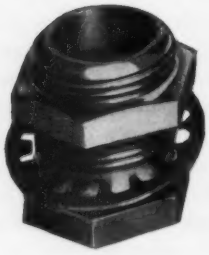
Circle 614 on Page 53



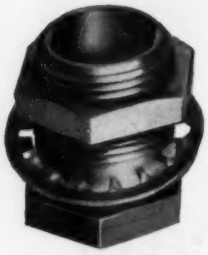
Adams Round Pin
Hardened, Ground,
Hard Chrome Plated

Adams
Round Bushing
(End View)
Open

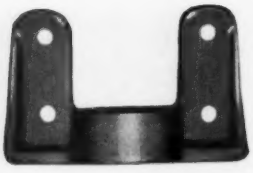
Adams
Elongated Bushing
(End View)
Hexagon Pin Inserted

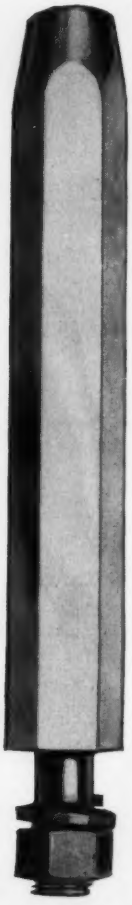


Adams
Round Bushing
Nut and Lock Washer
Long Flask
Short Plate



Adams
Elongated Bushing
Nut and Lock Washer
Long Flask
Short Plate





Adams Hexagon Pin
Hardened, Ground,
Hard Chrome Plated

Adams Pins and Bushings for Cherry and Aluminum Flasks assure you top quality and precision for close tolerance operation.

Proper mountings for pins and bushings for all Cherry Flasks are offered to meet practically all of your requirements.

Adams Pin and Bushing Mountings
(Cast Aluminum)
For Cherry Flasks
For Small Flasks—(Standard)

For New Equipment or as Part Replacement, the same care and accuracy in manufacture helps make the toughest jobs productive.

A wide variety of pin arrangements is included to complete our line. Write us at once for full information.

LET ADAMS HELP YOU ANALYZE YOUR FLASK EQUIPMENT PROBLEMS

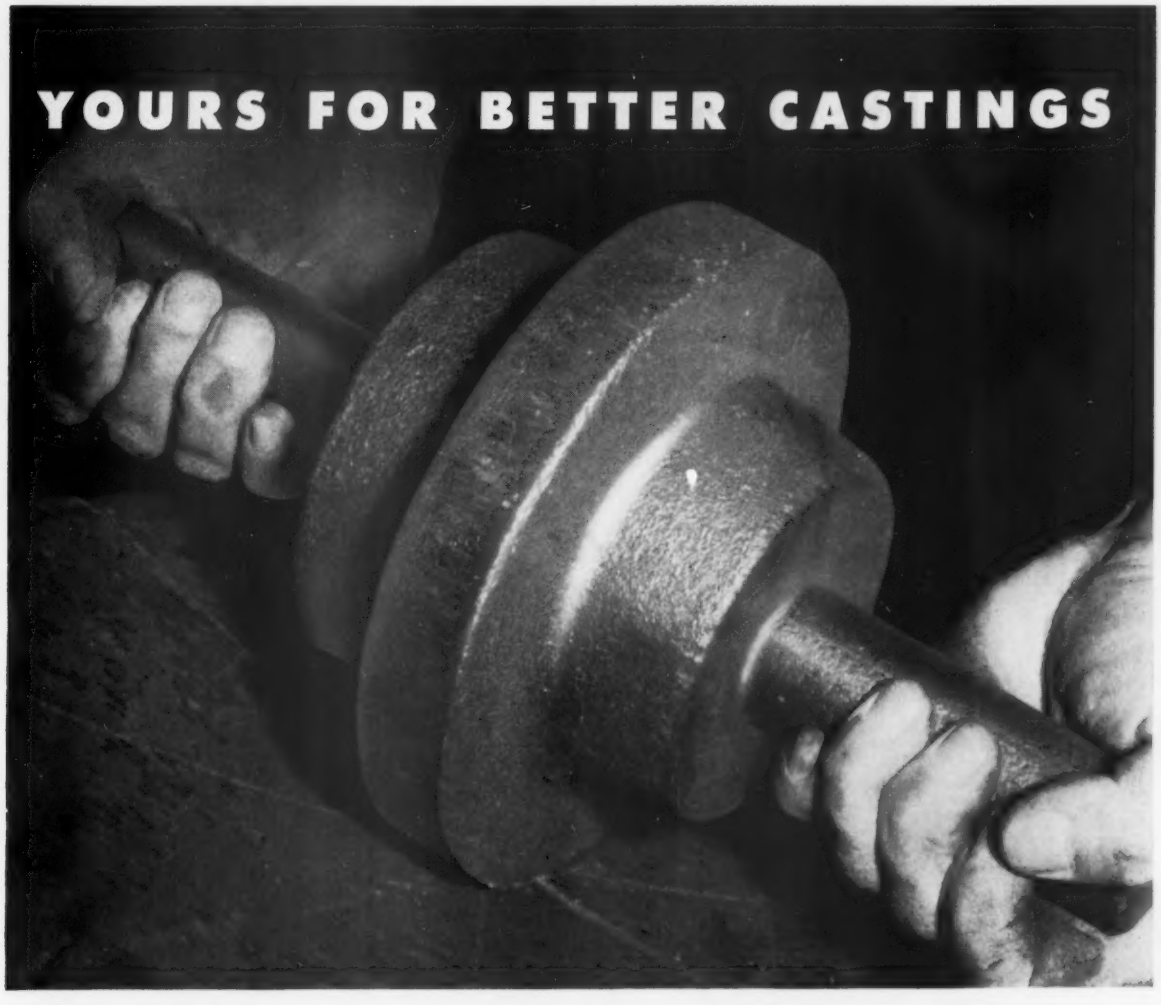
The ADAMS Company

ESTABLISHED 1883

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

MOLDING MACHINES and FLASK EQUIPMENT

Circle 615 on Page 53



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SILICA SANDS

THE WORLD'S FINEST SILICA SAND

99.89% PURE

Laboratory tests prove Ottawa Silica 99.89% pure.

OTTAWA SILICA COMPANY

PLANTS LOCATED IN OTTAWA, ILL. AND ROCKWOOD, MICH.

Serviced by two main trunk railway systems, Ottawa offers fast delivery to all corners of the nation.

SERVING THE FOUNDRY, GLASS AND CERAMIC INDUSTRIES FOR OVER 50 YEARS

Circle 616 on Page 53

let's take a second look at air compressor costs

Let's look at what Joy compressors have to offer in saving you money where it counts the most. Let's assume that all compressors are competitively priced . . . and go on from there.

eagle-eye the installation first . . . here's where specifying Joy saves a bundle. Why? Because Joy stationary compressors are "Packaged" units. They're shipped complete, ready to run without tedious, costly site assembly. Joy compressors need as little as one-half as much foundation. You can save up to $1000 on that item alone.

plus savings in maintenance . . . *All the wearing parts:* the cylinder liners, cross head guides, valves, etc., are replaceable at your plant, by your men. This is a Joy exclusive. No specialists needed, no fancy tools required. Joy engineered these compressors to run for years on minimum maintenance.

and on operation, we'll let the people who have used Joy compressors for years do our telling for us. Nope—no modesty . . . but the money they've saved in operating costs annually would sound unbelievable coming from us.

If you're frowning over the choice of your next compressors and what to do to save a needed buck . . . . . .

Take a second look and get in touch with a Joy Engineer. He'll show you how Joy saves you money on air. Write Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

WSW I 7165-243

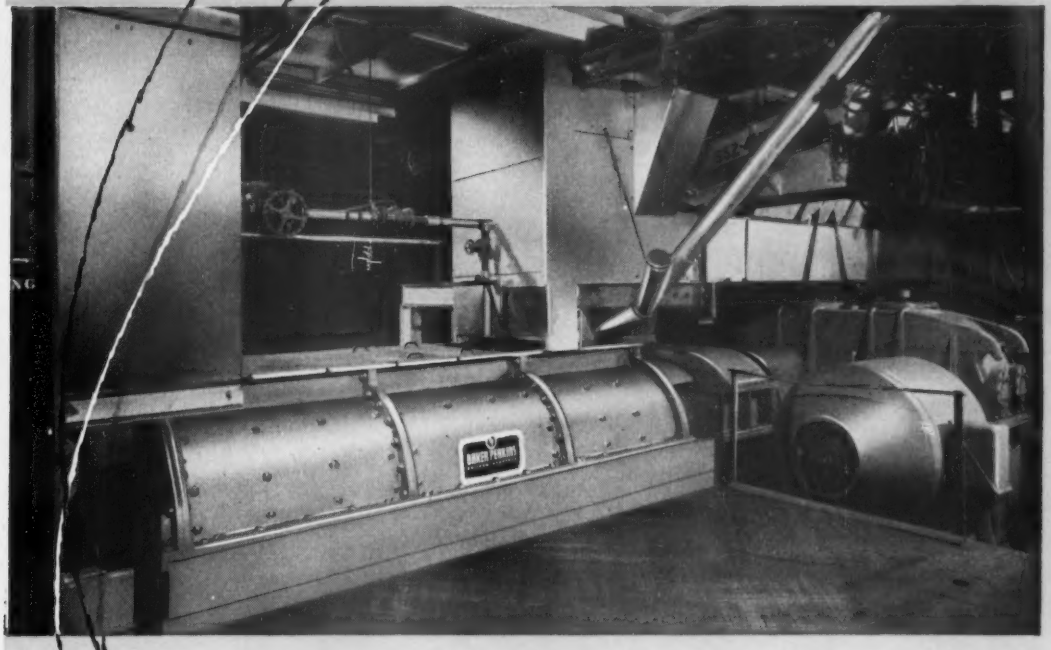
WRITE FOR FREE BULLETIN 243-13

JOY SAVES YOU MONEY ON AIR

COMPRESSORS • FANS • DUST COLLECTORS

Circle 617 on Page 53

NOW . . .
a single B-P Continuous Muller handles 300 tons of sand per hour



The new Baker Perkins Size 8 Muller, now in successful operation in one of the midwest's automotive foundries, has 300% more hourly capacity than any available batch type muller and 100% more capacity than the next size B-P continuous unit. As with all B-P Continuous Mullers, cleaner, smoother castings are obtained with fewer rejects because molding sands are thoroughly mixed and tempered. The special Sigma-type agitators assure that each grain of sand is coated with the correct proportion of bond.

Baker Perkins builds Continuous Mullers in capacities from 30 to 300 tons per hour. Because of their rigid, rugged construction, B-P Continuous Mullers give many years of service. Installations in many of America's largest foundries have proven the efficiency of Baker Perkins Continuous Mullers under the most exacting conditions.

For further information about B-P Continuous Foundry Sand Mullers and B-P Unidor mixers for core and special process sand mixing, send for catalog No. F-156.

371

BAKER PERKINS INC.

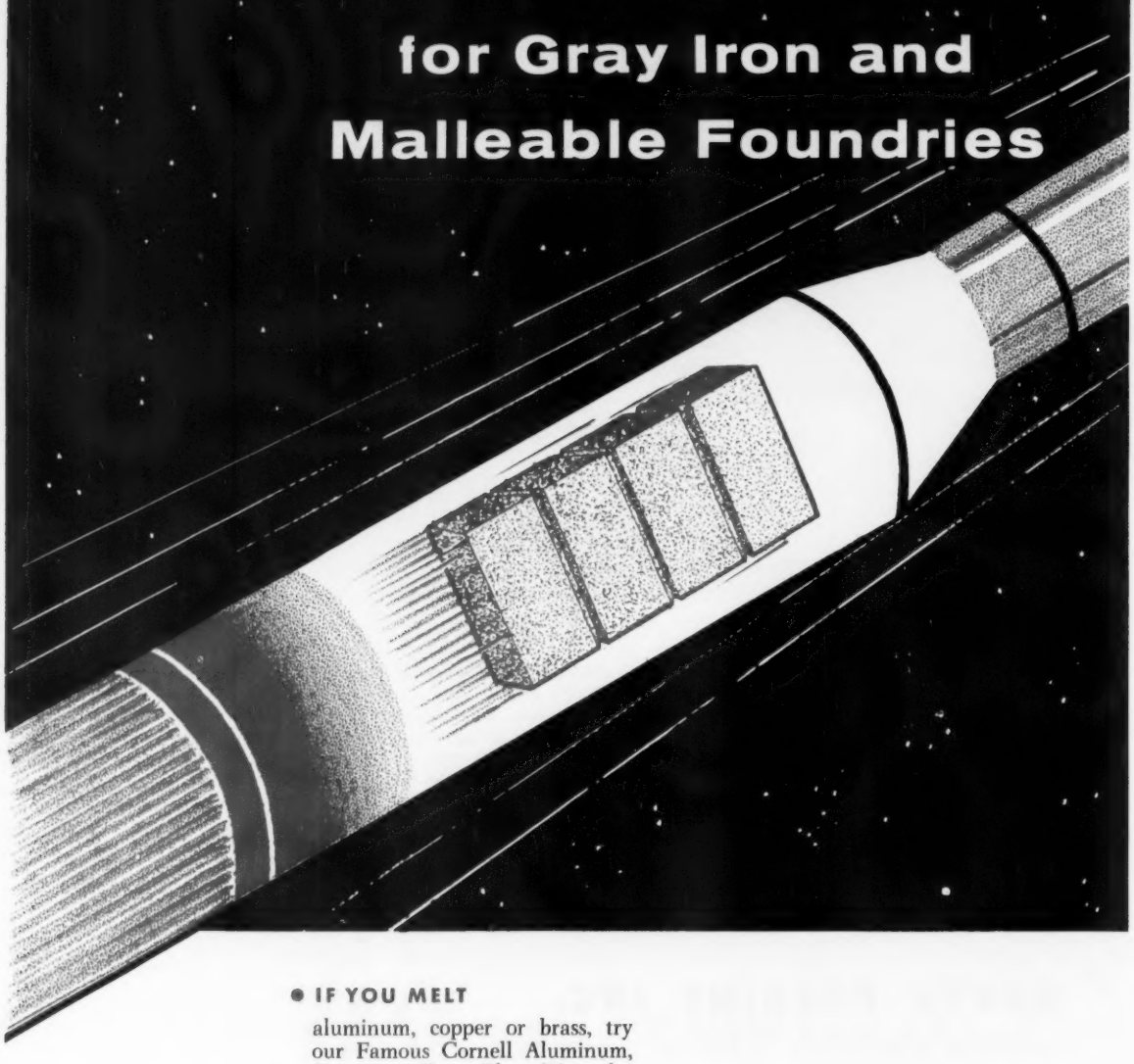
FOUNDRY MACHINERY DIVISION • SAGINAW, MICHIGAN

Circle 618 on Page 53

STILL LEADING IN THE..

Famous CORNELL CUPOLA FLUX

for Gray Iron and Malleable Foundries



● **IF YOU MELT**

aluminum, copper or brass, try our Famous Cornell Aluminum, Copper or Brass Flux. Write for Bulletin 46-A.

still the best way to get cleaner iron

Here's why:

Famous Cornell Cupola Flux is a special scientifically made combination of high-grade fluorspar and other materials which create a chemical reaction in molten iron greatly increasing slag flow off. By increasing slag flow off, drops are cleaner and digging out time is cut to a minimum. Castings made from clean metal are therefore uniformly hard throughout directly contributing to their tensile strength.

Use Famous Cornell Cupola Flux in your foundry frequently and your castings will lead the way in the Space Age, too.

"often imitated never equalled!"

The CLEVELAND FLUX Company
1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

chips or briquettes

—it's still world famous

HOEGANAES MELTING STOCK

GRADE "A"
available in briquette form—write for price & data folder No. 119

GRADE "E"
available in briquette or chip form—write for price & data folder No. 120

The very first on the American market. These Ancor Sponge Iron Briquettes or Chips are virgin, soft iron of extreme purity, free from tramp elements and dissolved gases. They're time-tested and field-tested as a raw material for quality steel production, primarily in acid open hearths, induction furnaces and basic electric arc furnaces.

Hoeganaes Ancor Sponge Iron is a metallic product reduced from iron ore at such low temperature that melting of the iron or the gangue constituents has not taken place. *They have exceedingly uniform analysis from shipment to shipment.*

This is of importance too . . . the following elements are non-existent or only present in trace amounts . . . Nickel, Molybdenum, Cobalt, Zinc, Hydrogen, Nitrogen, Chromium and Tin. Ancor Sponge Iron has a very high degree of reduction—96%. It performs at least as well as a low-carbon, high-grade ingot iron.

If you're interested in *regularity of your melting operation* and *greater uniformity of your steel analysis*, be sure to write for the fact-filled literature. Better still, ask for a Hoeganaes Engineering Specialist to call and give all the facts first hand. He's at your service.

HSIC

HOEGANAES

HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Los Angeles, Minneapolis, New England (Elmira, N.Y.), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

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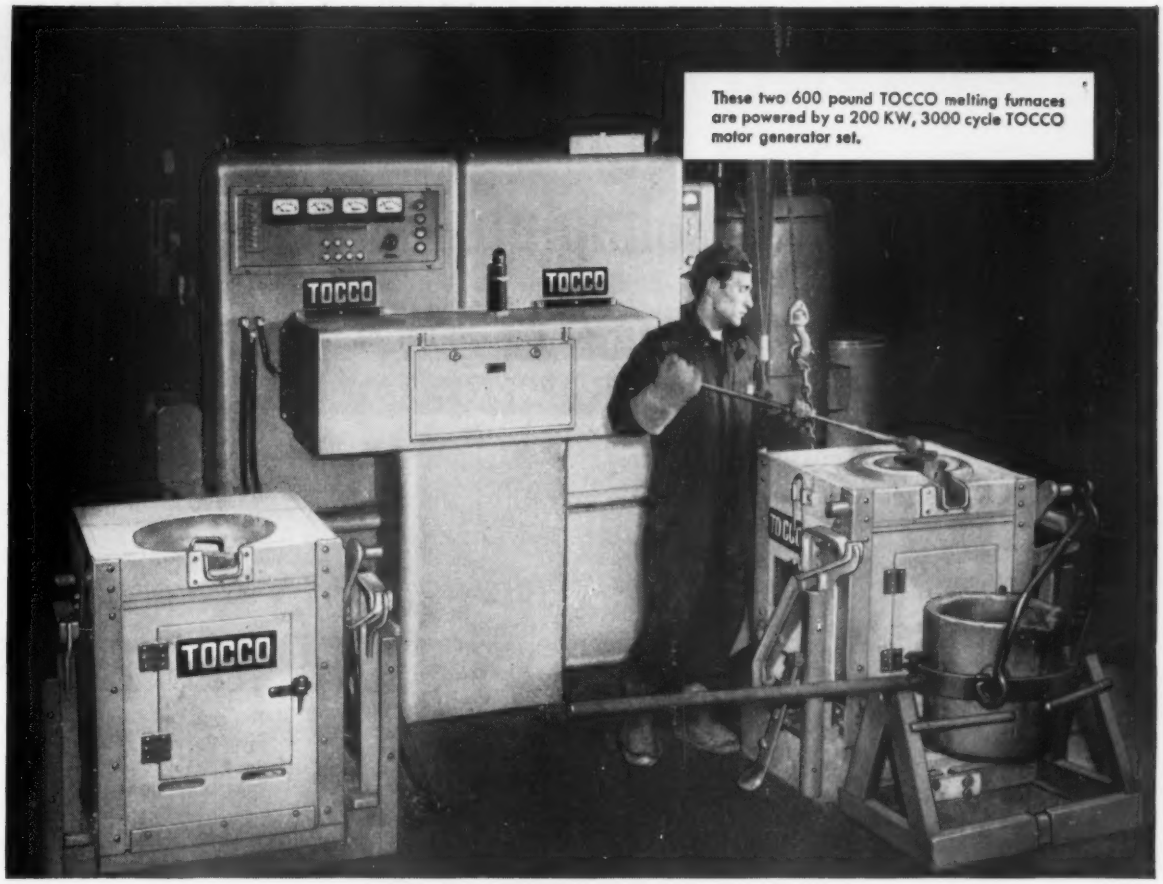


These two 600 pound TOCCO melting furnaces are powered by a 200 KW, 3000 cycle TOCCO motor generator set.

TOCCO* Induction Melting "Delivers" — In Two Days Instead of Two Months!

Casting backlogs at Commercial Shearing and Stamping Co. in Youngstown, Ohio, used to lag from 8 to 10 weeks behind production schedules. By installing four 300 pound TOCCO melting furnaces this firm upped daily melting capacity to 16,000 pounds. Now orders can be shipped in 48 to 72 hours.

In a foundry occupying less than 5,000 square feet of space, production of castings jumped between 40% and 50%; tensile strength of alloy castings was boosted from 35,000 to 50,000 p.s.i. Substantial savings in the cost of castings have resulted. Moreover, with precision casting and molding on a push button basis, many former drilling and roughing operations were completely eliminated.

Many firms have discovered that TOCCO Induction Melting insures maximum quality control, increased volume and lower operating costs.

Look to TOCCO also for *vacuum* melting furnaces of up to *5,000 pounds* capacity.

THE OHIO CRANKSHAFT COMPANY

TOCCO

*Trade Mark Reg. U. S. Pat. Off

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. F-4, Cleveland 5, Ohio

Please send copy of "The Case for TOCCO Induction Melting."

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State____

Circle 621 on Page 53

fine FANNER

...the Best chaplets ever developed

THREE EXCLUSIVE FEATURES and these standard features

1 FEATHEREDGE FUSION RINGS

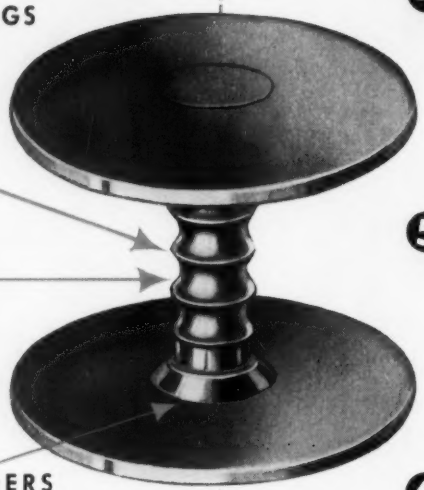
Knife-like edges on the multiple rings heat instantaneously to fusion temperature — completely sealing chaplet into casting and eliminating leakers.

2 COMPLETE CONTACT RADIUS GROOVES

Molten metal rolls up solidly against the rounded bases of the radius grooves. Greater chaplet area contact results in maximum fusion. No sharp angles to trap gasses or weaken stem strength.

3 COUNTERSUNK SHOULDERS

Heavy, tapered shoulders provide solid support to plates — allow full contact with molten metal. No sharp angles to create voids usually formed under heads of ordinary chaplets.



4 FULL STRENGTH

Reinforced construction at all required points provides maximum support without use of extra heavy metal.

5 PURE TIN COATING

The surest protection against rust, as well as aid to fusion. Readily alloys with iron and steel, lowering melting point and improving fusion. Also available in pure copper.

6 PRECISION TOLERANCES

Held to ±.002 on most sizes, Fanner reputation for accuracy is unequalled.

HERE IS WHY THESE FEATURES MEAN BETTER CASTINGS FOR YOU

✔Assured Core Support ✔Maximum Fusion
✔Freedom from Leakers ✔Accurate Wall Thickness

The Groovestem Chaplet is the direct result of Fanner pioneering and development to provide foundries everywhere with chaplets that would assure better quality castings. Since their introduction, millions of Fanner Groovestem Chaplets have been used by all types of foundries and it has been proved that these chaplets are responsible for savings in time and labor and for reducing casting scrap. For the best results always specify Fanner Groovestem Chaplets, they are available in a wide variety of styles and sizes.

Write for catalog or samples and prices.

THE FANNER MANUFACTURING CO.

Designers and manufacturers of fine FANNER CHAPLETS AND CHILLS

GROOVESTEM CHAPLETS

to insure maximum fusion and support

FANNER DESIGN TAKES ADVANTAGE OF ALL METAL CHARACTERISTICS

COUNTERSUNK SHOULDERS ELIMINATE GAS POCKETS

Sharp, right angle shoulders of conventional types of chaplets form large gas pockets.

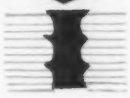
Raised shoulder of this type reinforces but tends to form small gas pockets.

Fanner Countersunk shoulder has a taper design which reinforces head and eliminates gas pockets.

FEATHEREDGE FUSION RINGS ELIMINATE LEAKERS

Rolling metal does not seal against straight side of conventional stem; small pockets remain.

Deformed stem offers better sealing surface for metal, but some voids may be created on inside radii.



Knife-like edges of fusion rings of Fanner Chaplet heat instantly, fuse completely, eliminate leakers.

RADIUS GROOVES EFFECT MAXIMUM FUSION

Conventional chaplet fails to fuse completely both along stem and at shoulders.

Threaded stem creates gas pockets at base of threads.

Rounded grooves of Fanner Chaplet permit metal to "lay up" close to stem and effect maximum contact and fusion.

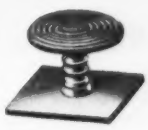
SPECIFY FANNER GROOVESTEM CHAPLETS

Studies conducted by Battelle Memorial Institute of Columbus, Ohio, supplemented by field tests in leading foundries, prove that the new Fanner Groovestem Chaplet provides the maximum in core support and completeness of fusion. Companies doing critical casting work have confirmed its superiority and have standardized on this new chaplet. To insure that you get maximum casting efficiency on every job, always ask for Fanner Groovestem Chaplets. They are stocked in substantial quantities to give you the fastest possible service.

FANNER GROOVESTEM CHAPLETS ARE AVAILABLE IN THESE TYPES

MOTOR

DOUBLE HEAD



BUTTON HEAD

BROOKSIDE PARK · CLEVELAND 9, OHIO

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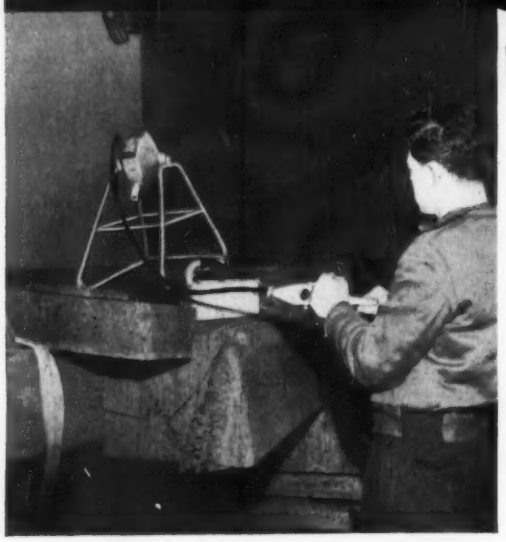
COMPLETING THE PICTURE . . .

Nuclear Systems Economical, Portable Radiography Machines



MODEL 10 IRIDITRON

"In two or three hours with these machines, we can perform radiography jobs which would have taken 35 to 40 hours with conventional X-Ray equipment," says Mr. Frank Steele, Director of Non-Destructive Testing of Froehling-Robertson, Inc., Richmond, Virginia. Mr. Steele's company has four Nuclear Systems Model 10 Iriditrons in constant use, and plans to buy more.

This is a company whose sole business is testing. Time and cost are naturally of utmost importance . . . and Froehling-Robertson, Inc. has found that it can perform its services faster and better for the company's many customers through the use of fast, portable, economical, safe Nuclear Systems equipment. "Companies have been amazed by the speed with which we can perform our testing. Production has greatly increased," adds Mr. Steele.

There's a Nuclear Systems radiography machine to fit your testing requirements . . . and budget. For information about it, write any of our sales offices.

PHILADELPHIA • CHICAGO • SAN FRANCISCO

NUCLEAR SYSTEMS

A DIVISION OF THE BUDD COMPANY, Philadelphia 32, Pa.

Budd

Readers' Comment

Permanent Mold Machine

To The Editors:

I have noticed with interest your article on Page 194 of the December, 1958, issue of Foundry.

I would like to call to your attention our ad on Page 200 of the same issue of the Foundry which illustrates a machine which we manufacture for producing permanent mold castings in high production. This machine operates in a somewhat similar manner to your explanation except that we remove the cope automatically from the drag and eject from the cope rather than eject from the drag.

Our machine is used primarily to produce aluminum electric motor rotors in high production. However, it is also being used for producing other types of aluminum castings. The same machine, of course, can be used to produce any type of metal that can be made in a permanent mold.

Nathan Janco
The Centrifugal Casting Machine Co.
P.O. Box 947, Tulsa, Okla.

Stress and Strain

To The Editors:

The article "Casting Design—Some Fundamentals," by John B. Caine, presented in the January issue of Foundry is excellent, and important since foundrymen must take more interest in that subject. The designer seldom has time to become familiar with the details of our favorite process, so we must learn something of his problems.

The article is a good start in this direction. There is one important point on which I'm sure the author will agree, but which was not included. Calculated stress values are only an approximation, in other than very simple shapes. Therefore, stress analysis with strain gages or brittle lacquer would be necessary to establish accurate values.

For example, I am sure that the actual stress in the "D" or "E" design of the lever illustrated in the article would not be as high as the calculated value at the indicated point, due to the generous section produced in that area by rounding of the core. Conversely, actual stresses in the oval section design "A" might be considerably higher than calculated at the junction with the large boss.

Charles F. Walton
Technical Director
Gray Iron Founders' Society
National City-East 6th Bldg.
Cleveland 14, Ohio

Editor's Note: Several others have written to the author emphasizing the importance of stress analysis. References to the subject will be included in future articles of Mr. Caine's series.

Oxidizing Selectively

To The Editors:

In your December, 1958 issue you have an article describing the use of oxygen in a coal-fired air furnace.

On the second page of this article, you state that if the content of silicon, manganese, or carbon is greater than that desired, high-purity oxygen can be used to oxidize these elements. This is readily understood; however, you state further that it is possible to selectively oxidize silicon and carbon by the use of additional oxygen.

We would appreciate an explanation as to how it is possible to selectively oxidize silicon and carbon in a bath in this manner.

N. G. Petros
Chief Engineer
Canton Malleable Iron Co.
Canton 5, Ohio

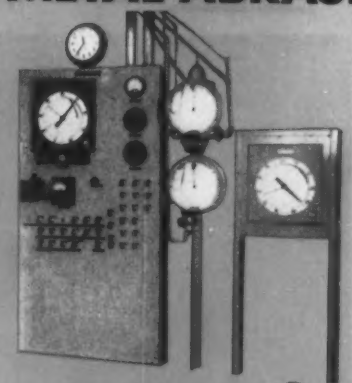
Editor's Note: The author of this article on oxygen use replied to the above question as follows.

Our experience shows that gaseous oxygen can be used to oxidize silicon and carbon selectively in a malleable air furnace operation.

It is an established fact, for example, that in the conventional blowing of iron in the production of steel, carbon is oxidized after the oxidation of silicon and manganese takes place. The oxidation reaction between oxygen and/or iron oxide and silicon and manganese takes place at lower temperatures—approximately 2550 to 2700° F—while carbon is removed at higher temperatures. How much and how fast silicon can be removed will, of

Circle 624 on Page 53→

Now!
METAL ABRASIVE



CUSTOM MADE for YOU

The newest development in manufacture of metal abrasive is **custom-made** "Malleabrasive"—job-lot-made to meet individual cleaning conditions.

By means of new, highly specialized processing techniques and equipment used only by us, we can make the type of "Malleabrasive" shot or grit that will do your particular job best, at lowest cost to you.

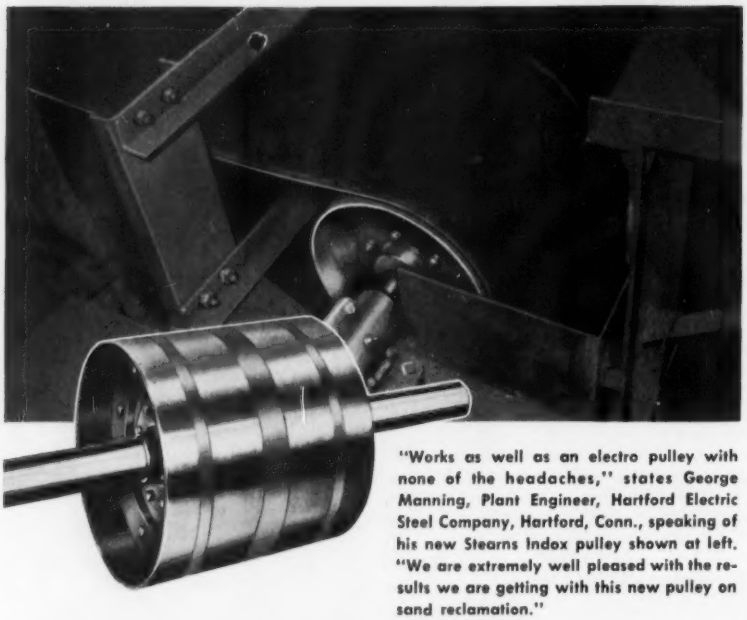
Why put up with general purpose abrasives when you can have "Malleabrasive" tailor-made for you? We'll welcome the chance to tell you how you can benefit. Write us.

new G-2 MALLEABRASIVE

THE GLOBE STEEL ABRASIVE CO.
Mansfield, Ohio

Sold by Pangborn Corp., Hagerstown, Md., and by many leading distributors of foundry supplies from coast to coast.

New For Foundries!



"Works as well as an electro pulley with none of the headaches," states George Manning, Plant Engineer, Hartford Electric Steel Company, Hartford, Conn., speaking of his new Stearns Indox pulley shown at left. "We are extremely well pleased with the results we are getting with this new pulley on sand reclamation."

STEARNS INDOX V

Permanent Magnet Pulley Equals Electromagnetic Types

Removes Iron, Helps Reclaim Sand

Now you can clean foundry sand efficiently — at lower cost — with an entirely new kind of permanent magnet pulley from Stearns — the Indox V Pulley. It is the first permanent pulley designed to meet all the requirements of the foundry industry — has all the deep-field holding power of an electromagnetic unit with none of the cost and maintenance disadvantages.

Indox V is the amazing *ceramic* material used in Stearns pulleys and separators exclusively. With Indox V, Stearns offers the most advanced permanent magnet pulley with radial pole design, producing a magnetic field that effectively pulls out long cores and gaggers that often slip through an ordinary permanent magnet field.

Available in standard widths from 12 to 48 inches, diameters of 12, 15, 18, 20 and 24 inches. Stearns engineers will help you select the right pulley. Call your Stearns representative, or write for Bulletin No. 1021G.

CHECK THESE ADVANTAGES . . .

- Costs nothing to operate
- Free of power failures
- Eliminates rectifier
- Needs no maintenance
- Impervious to moisture

STEARNS MAGNETIC PRODUCTS

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY

635 SOUTH 28TH STREET • MILWAUKEE 46, WISCONSIN

course, depend on the amount of silicon, manganese, and carbon in the bath during the oxidizing period.

Examination of curves showing the relationship between oxygen injection quantity, bath temperature, and per cent silicon, carbon, or manganese, shows that the removal of silicon and manganese is favored by lower bath temperatures, provided other metallurgical conditions are satisfied, whereas oxidation of carbon is favored by high temperatures.

This same principle of selective oxidation applies to the malleable air furnace as well as to steelmaking and other ferrous melting processes.

For example, in a malleable furnace it is possible to remove small amounts of silicon up to about 0.15 per cent by injecting oxygen either on the surface of the bath (using multi-lances) or just below the surface. The bath temperature should be less than 2700° F when injection takes place.

The quantity and rate of oxygen injection will depend on the initial bath temperature and the total amount of silicon to be removed.

The Law of Mass Action

Small amounts of manganese and negligible amounts of carbon also will be removed simultaneously with the silicon. This follows the principle of the law of mass action. However, the amount of manganese and, more particularly, the amount of carbon that are removed are so small that an adjustment in the bath would not be necessary.

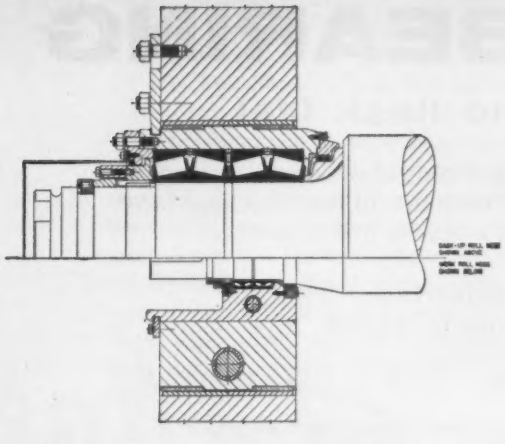
We can summarize the selective oxidation of silicon by saying that to successfully oxidize silicon selectively in a malleable air furnace bath, consideration must be given to: 1. Initial silicon content. 2. Initial bath temperature. 3. Oxygen input rate. 4. Total time of injection. 5. Dispersion of oxygen onto or below the surface of the bath. 6. The manganese and carbon contents of the bath will have an indirect influence on the rate of silicon removal.

To remove carbon selectively from a malleable air furnace bath, essentially the same underlying metallurgical principles apply to carbon as those for silicon.

To remove carbon selectively we must satisfy these conditions: 1. Bath temperature must be above 2800° F. 2. Oxygen input rate must be considerably greater than that used for silicon removal. 3. Oxygen should be introduced just below the bath surface rather than on the surface of the bath. 4. The furnace combustion flame during the injection interval should be definitely oxidizing.

Again, small amounts of silicon and manganese will be removed during the carbon oxidation period, but usually no adjustment in the bath is necessary.

J. B. LaPota
Research and Development Dept.
National Cylinder Gas Div.
Chemetron Corp., Chicago 22



How **LOEWY-HYDROPRESS** mounts rolls of this 12 x 43 x 42 mill on Timken bearings to take shocks, assure longest, most economical life.

Rolls up to 20″ x 20″ the "hard" way... Timken® bearings take the shock

THIS powerful 4 Hi reversing mill, built by Loewy-Hydropress Division of Baldwin-Lima-Hamilton Corp., is doing its job the "hard" way—rolling small slab ingots of special hard alloys up to 20″ x 20″. To roll them down to .010″ or less takes a lot of force. It's hard work. This mill operates at a separating force of 140,000 lb. per inch of width—at speeds from 75 to 200 fpm. To take the heavy shocks, keep bearing cost down, Timken® tapered roller bearings are used to mount the back-up and work rolls, screwdown drive and screwdown worm gear. 24 Timken bearings all told.

Here are the big reasons why 1008 steel mills use Timken tapered roller bearings on roll necks:

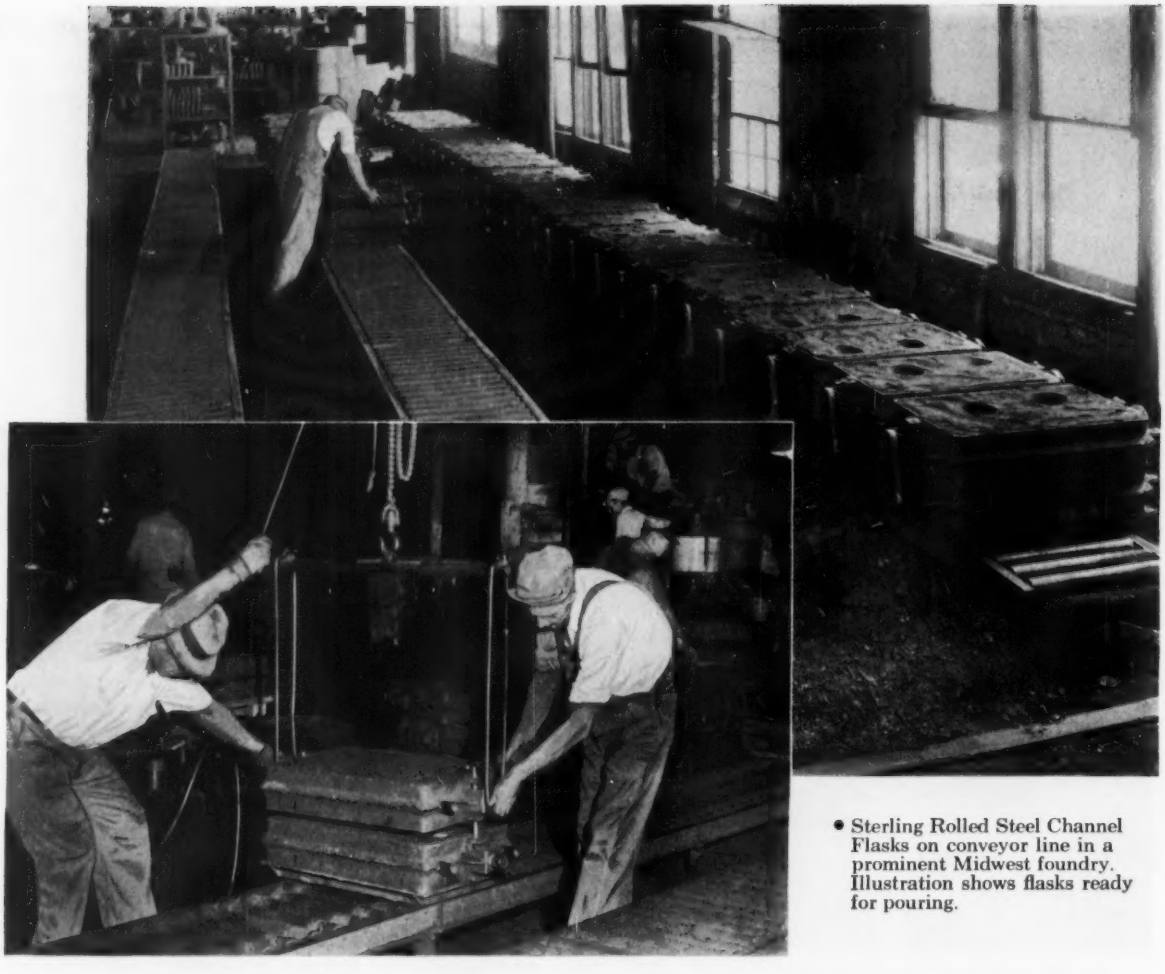
1. Longer life. Tonnage records show that the long life of Timken roll neck bearings keeps bearing cost per ton of steel rolled at rock bottom. **2. Better mill rigidity.** Balanced proportion design of Timken bearings permits larger roll necks than ever before possible with tapered roller bearings. Load ratings are increased up to 40% due to Timken bearings' balanced proportion design. **3. Simplified lubrication.** No complicated systems; Timken bearings permit use of simple grease lubrication. **4. No special thrust bearings needed.** Timken bearings take *both* radial and thrust loads. **5. Steel loss ended in mill stops and starts.** Timken bearings permit starting under full loads. **6. Faster mill rolling speeds** because Timken bearings minimize friction.

Timken bearings make any machine better. And better machines make better products. That's Better-ness. And the trade-mark "TIMKEN" is your symbol of Better-ness. Look for it. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

BETTER-ness rolls on **TIMKEN**® tapered roller bearings

Circle 626 on Page 53



• Sterling Rolled Steel Channel Flasks on conveyor line in a prominent Midwest foundry. Illustration shows flasks ready for pouring.

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WHEREVER METALS ARE CAST . . . FOUNDRY
April 1959

An Adequate Yardstick

On this page last October, Managing Editor William G. Gude presented index figures of castings shipments, based on tonnages, which seemed to show that the market for castings during the past eight years has lagged behind the trend for general business. Many leaders in the foundry industry have expressed concern with this picture.

Recently some have questioned the accuracy of tonnage statistics as a measure of performance and progress in the marketing of castings. They contend that technological progress has made such radical changes that some more accurate measuring stick is desirable.

To back up this opinion, they point to radical changes in physical properties of castings, changes which have permitted bulk to be replaced by lighter sections with considerably greater strength. As a result, a customer who uses just as many castings today as he did several years ago is using considerably less total weight.

What can be used as a measure that will take into consideration these technological changes and indicate more accurately what the foundry industry is doing?

Some have considered using the dollar value of sales, but in a time of inflation or deflation, this yardstick leaves something to be desired.

F. Kermit Donaldson, executive vice president, Steel Founders' Society of America, offered a rather novel idea for evaluating performance at the group's recent annual meeting in Chicago. The suggestion is presented in some detail in the report of the society meeting, starting on Page 148 of this issue, but the basic idea is this:

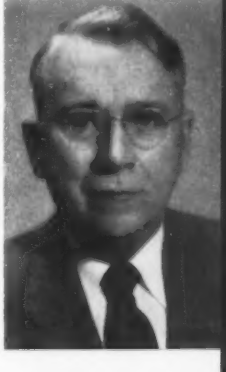
Mr. Donaldson believes that customers for steel castings actually are purchasing strength rather than pounds of metal in a particular shape. Therefore, he suggests a method based on the strength factor.

To illustrate, he first determined the average tonnage of carbon steel castings and alloy steel castings shipped during the periods 1946-50 and 1956-58. These were multiplied by assumed average yield strengths, which purposely were on the conservative side. The result was called "strength units."

These computations indicate that, on the average, buyers of steel castings received nearly 20 per cent more strength units per pound of castings purchased—or, in other words, intrinsic value—during the 1956-58 period than in 1946-50. They indicate progress on the part of the industry in meeting a growing need of its customers.

Although the suggestion is based on steel castings, it seems to be well adapted to all types of castings used in engineering construction. It is an interesting idea which should provide a basis for further discussion.

Who else has a suggestion?



Frank G. Steinebach
Editor

Fig. 1—Market trend research analyzes major shifts in the economy. Economic growth forecasts like these aid planning

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● MARKETING is common sense. It emphasizes profit rather than production, but always recognizes that one cannot exist without the other. Its purpose is to stop continued losses to competing processes and to lessen the impact of violent, cyclical swings of our national economy. Marketing is a means of by-passing unreasonable and ruinous sales policies. It can lead to a more desirable future for the casting industry.

Marketing establishes an organized, systematic, economical, straight-line method for developing new markets and serving present markets, and it controls efforts in both of these directions.

Customer Is Key—The customer is the center of all marketing effort. Marketing determines where the customer is and what he wants, persuades him to buy, and organizes the services that will retain present markets and attract new business. The essential activity of marketing is not new; successful business enterprises have practiced it for years. Mistakes were natural, but techniques have been refined; and a new, practical type of marketing has emerged.

How It Works—Many customer-related activities have been spread over organizational authority not directly related to the customer. The idea of marketing brings the responsibilities for these functions under one authority.

This authority may be vested in a marketing manager, a sales manager, a vice president of sales, or a man with any other title that you want to give him. In smaller firms, he often is the general manager. The important point is that this man is given both line and staff authority for all actions that affect the markets and customer relations of the company.

In effect, the traditional business organization chart which served the era of a sellers' market thereby is realigned into the kind of organization which will serve an era of a buyers' market more adequately. That's the kind of a market we have today and are likely to continue to have for the foreseeable future.

Who Needs Marketing?—Foundries of all sizes have a stake in marketing. Certain parts of the marketing job can be done at relatively low cost through trade associations. These groups exist to provide members with data too costly and difficult for an individual company to gather by itself.

Even a small company, however, can afford some professional marketing services—particularly for pinpointing prospective market areas

IS COMMON SENSE

Marketing is essential to the continued growth and prosperity of your company. Its goals are to prevent losses to competitive processes and to soften the impact of business cycles

By GEORGE K. DREHER
Market Development Director
Steel Founders' Society of America
Cleveland

and customers. Some of these data can be obtained readily, if time is available, by the foundry's own staff. Richard C. Meloy, marketing director, Gray Iron Founders' Society, described a do-it-yourself approach in his article "How to Build a Marketing Program" in the May, 1957, issue of FOUNDRY.

The Functions of Marketing—For foundries, marketing functions are divided into these areas: 1. Market research. 2. Product planning. 3. Sales and sales promotion. 4. Customer service. 5. Administration and training. Each requires analysis as to scope of activity, results expected, and general recommendations.

I. Market Research

Market research must be looked on as a decision-making tool. It provides data which establish odds in favor of the user. These odds increase as the research is carried deeper.

Trend Research—Market trend research begins with the primary needs and wants which make up an economic unit such as the United States. The first, broad steps consider the population's need for food, clothing, and shelter. Desires for comfort, services, enjoyment of life, and luxuries then build a complex economy.

It helps to understand trend research if you remember that all of the nation's business functions only to serve the wants of the people.

Naturally, there is considerable competition for John Q. Citizen's money, and terrific efforts are made to change his wants from one thing to another.

These individual wants do change, and this change creates major shifts in the whole economy. The fact that a family unit buys a washing machine instead of a new car, invests in a boat instead of a large wardrobe, buys "built-in maid service" instead of purchasing foods in bulk, or sends its children to college and economizes elsewhere accounts for some of the major shifts in recent years. No matter what the shift, the foundry industry is affected somewhere along the line.

Interpreting Individual Wants—From a viewpoint of desirable business planning, it is necessary to know the end effect of these shifts. The economist analyzes and interprets them to determine market trends. Fig. 1 is an example of basic economic growth forecasting.

Interpreting Trend Data — The manner in which data are interpreted determines the accuracy of any prediction. Figures can be misleading. Every effort must be made to measure past production and to predict future probabilities on a comparable basis, as by units of goods or by the use of a constant dollar.

The effect of exports and imports also must be blended into these predictions. This factor can have a gentle over-all effect, but may be a major factor in individual company planning.

Predicting Business Cycles — Trend research also has the developing task of predicting business cycles. There is every indication that business cycles will continue as they have in the past. The individual company cannot do much about these cycles unless markets can be discovered which have peaks in their cyclical curves while some of the other markets are in the

valleys of those same curves.

Knowledge of such cycles enables a company to plan more intelligently and to end each cycle with a net profit, even if the valleys persist. Such research eventually may help to avoid severe ups and downs of the total economy at the same time. Fig. 2 shows the erratic cyclical nature of the total castings market since 1943.

Short-term Forecasts — Short-term predictions have been extremely difficult to handle, but can be of great value. With moderate support, trend research can develop odds favoring short-term predictions for any given market from data that now are available. Further development is required, but there is every indication that reasonable accuracy can be achieved. Chart 3 demonstrates a possibility in this field.

Foundries up through the medium-sized category customarily are not in a position to develop basic trend and economic data. This job is an area of trade association service. Most of America's larger industries have market research departments, but even they use background information from economic research organizations.

Past Markets — The "historical market record" is another essential part of market research which a trade association is in a better position to develop than virtually any other type of organization. It is about the only agency that can produce an end-use record by foundry markets on a direct reporting basis. An example of end-use consumption by markets in the steel castings industry is shown in Fig. 4.

The historical castings record alone will not reveal the actual trend for any one market. A look at the curve for similar markets in the over-all economy is needed at the same time.

A blend of economic and historical castings data makes possible a more accurate picture and provides a basis for sound judgment about a given marketing effort. These figures also help to reveal the extent to which technological change and competitive inroads have affected the use of castings. More will be said of this a little later.

A desirable step at this point is to match the individual foundry's historical end-use market record with that of the industry. This job can be done by analyzing production over a period of years, something which requires definite knowledge of customer markets. Historical data on an over-all basis indicate trends which, when related to individual foundry market history, and integrated with market and technological trends, help determine sound policy decisions.

Considerable information is available to everyone through the Office of Business Economics of the U. S. Department of Commerce. The best place to start is in the local Department of Commerce office. These data are reported in terms of the Standard Industrial Classification Code, which is explained in a book available from the same source.

For purposes of the castings industry, the SIC Code does not refine end-use market data to an appropriate degree. Efforts are being made to achieve more refinement of data, but their success will depend to a considerable extent on the budget limitations imposed on this branch of the Department of Commerce.

Opinion Research—"Opinion research" aims at another important principle of marketing: "It is more important to know what a customer wants than what he needs."

Opinion research is directed toward finding out just what a customer wants in the way of the product he uses or will use. It

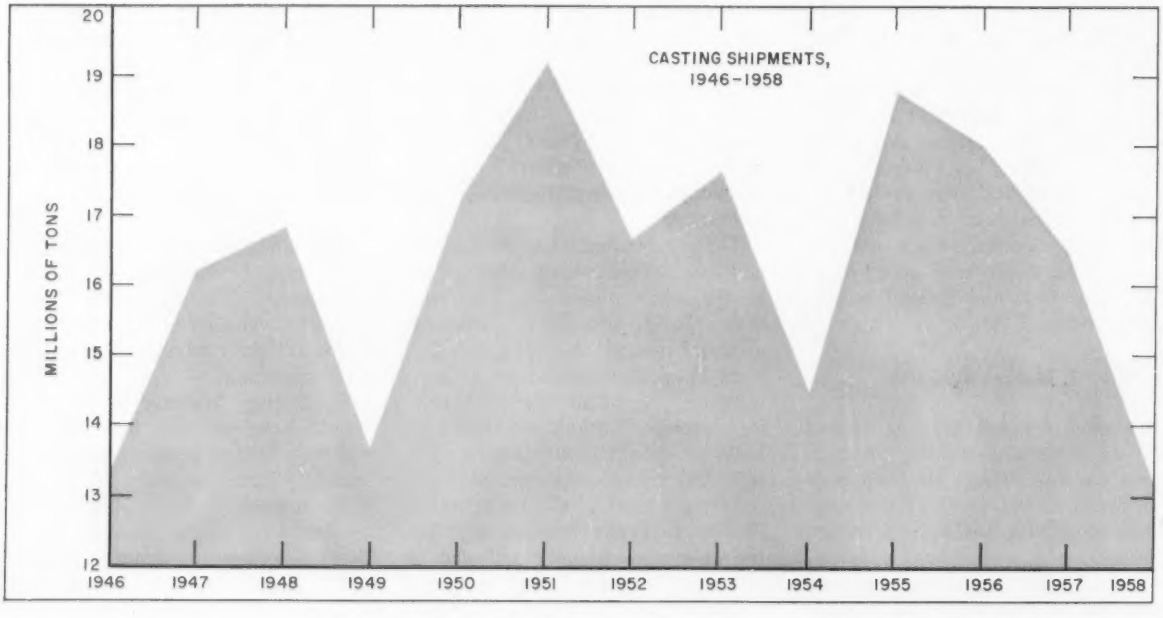

Fig. 2—Knowledge of business cycles helps a company to plan intelligently and to maintain profits. Chart illustrates cyclical nature of castings production

seeks to determine how additional wants can be stimulated or how these wants can be satisfied.

Surveys and interviews are used to develop some of these data. The credibility of surveys always is questionable. The result is represented by the replies received, and sound conclusions are difficult to reach. Personal interviews have paid off in some instances, but the odds are poor.

An excellent review of this procedure is incorporated in an article entitled "Finding out What Customers Will Buy," *Steel*, July 14, 1958.

To get the real lowdown on a company or an industry, an outside research agency and complete anonymity are best. A sufficient number of interviews must be conducted, and replies to certain questions must agree enough to permit a reasonably firm decision as to the customer's real opinion or real wants.

An extremely important facet of this type of research lies in the fact that the customer wants many things, as long as they do not increase the price or, better still, do not increase his end cost. In fact, all the things the customer wants are expressions of a desire to lower his end cost or to protect and expand his own markets.

Another important point lies in this fact: Today, customer organizations are far better educated than they were 25 years ago. The casting industry is selling to a more critical market group. This trend will continue, and any marketing plan must recognize that fact.

The end result of "opinion research" is to determine how to sell more castings for more uses. This goal can be accomplished only by making it easier for the customer to use castings and for his customer in turn to accept them as engineering materials. General confidence in cast products must be increased in the minds of both parties. It will do no good to conduct research of this type unless foundries use the findings to improve their own practices.

Technological Trend Research—Change is the only permanent factor in modern technology. Some of these changes we can see or sense, but others always are in the background. They may spring out of the research laboratory or development stage at any moment and upset or alter any given market.

The primary principle behind technological change lies in the constant search for greater engineering economy. This approach considers all elements through the life of the machine or the function which it is to perform. Thus a steam turbine in a powerplant may be designed to function smoothly over a 40-year period or more, whereas a missile has a life that might be measured in minutes or less.

Technological change provides both opportunity for sales and a threat to present markets. The Union Pacific Railroad, for example, recently placed in service some 8500-hp gas turbine locomotives. This change from diesels could have meant use of few or no castings had it not been for a hawk-eyed foundry organization. Its product engineers anticipated this development and were in on the ground floor. They accomplished acceptance of cast products in the newly designed gas turbines.

Emphasis on New Products—*Machine Design* annually conducts a survey of design engineering problems. Historically, the main concern of design engineers has been reduced costs, but in 1957, and even more noticeably in 1958, the main effort of these men shifted to new product design. This shift should be a cue to all material suppliers, and particularly to those of us in the castings industry.

The fact that intense effort is being devoted to new products means that a lot of old ones will disappear from the market. If the foundry industry is not in on these new designs, castings volume will decline in the years ahead.

Digging into the effects of potential technological change is a fairly expensive process. About the only men who can come up with the answers are those who are working in research laboratories. Some of their research does not pay off, but much of it does. Market research in this field means that these men must be sought out so that impending changes can be uncovered.

Changes which are closer to reality can be identified in trade literature. These developments have to be assessed properly since some may become important market factors and others may not. Sometimes, too, a "sleeper" product which has not found much use for several years suddenly blossoms forth because other technological changes have made its application practical.

A foundry helps itself by watching its customers' research and development programs. It is in these activities that the measure of your future position with customers can be appraised. It is at this stage that the use or nonuse of castings is largely determined.

You may think that you are fortunate if a customer is not doing much in the way of research and development. It may mean, however, that the customer is falling behind the parade. Every industry that expects to stay in business needs new products or major refinements of present ones to assure its future market position.

Foundry Technology—Advancing technology within the castings industry itself can mean major losses or gains for foundries. Shell molding, for example, although it may seem like old stuff, is moving rapidly into the field of larger castings. Other processes are reaching out steadily for a larger share of the castings market and opening up applications new to the foundry industry (See Fig. 5). Technological change can catch you napping at both ends of the line.

For the medium or small foundry, much of what has been discussed can be achieved only through group effort and constitutes a logical field of activity for a trade association. What we will discuss from this point on is a matter of individual company concern. We are reaching down to a front-line sales effort in which a group cannot be active without confusion to its members. It is the responsibility of the individual company to sell its own products.

Individual company action requires the decision-making help of the trend, opinion, and technological research which has been outlined. Without it, odds on the effectiveness of subsequent action are poor.

Market Penetration—Penetrating a market may sound like an expensive proposition. It is a job that can be done by the individual

company if it takes the time to seek out techniques that give the answers. Fortunately, many market research organizations exist that can achieve this function at a modest expense.

Locating Markets—Available data can help to identify the location of markets. So much has been written about this subject that a lengthy description is unnecessary.

Here again, the U. S. Department of Commerce is of help with information that carries the Standard Industrial Classifications (SIC) down to the county level. Another source, both at the national and county level, is major publishers of trade journals, each of whom has marketing and market research information in one form or another available for the asking or at relatively moderate cost.

Some identify the actual firms engaged in producing metal products or equipment according to the SIC code. With IBM card systems, this service makes it possible to obtain the names of companies in SIC market classifications for a county or state or on a nationwide basis.

Such data are fundamental to any market penetration effort, but there still are some additional functions to perform. The SIC Code identifies a plant, whether it be integrated or a branch of a larger organization, by the major product line. This system frequently leaves other product lines unidentified although many of them might offer a market for castings. These must be dug out by the foundry or an outside consultant.

Product lines for each company in a given market can be obtained through trade directories, credit organizations, stock market descriptions of company product lines, state directories of manufacturing, local chamber of commerce information, and, of course, the old standby—walking in and finding out.

In any event, the idea is to end up with a listing of companies in the desirable areas and markets to be served plus a description of their product lines. Penetration can go deeper, but these points will be covered later, under sales and sales promotion. The chief point here is that efficient sales planning requires two factors: 1. Penetration down to the customer level. 2. Analysis of their product lines.

When you have this information, the second major function of marketing for the foundry industry can be analyzed.

II. Product Planning

Product planning involves products and product range, policies, product and market development, and product management. Size of company makes no difference as far as need for this planning is concerned, but it does make a considerable difference in practical policies.

Producing the Market—It is the job of marketing to produce the market. Thus the first policy decision revolves around this question: Is the foundry going to stay at its present ability level and seek markets where it can sell what is now produced, or is it going to serve specific markets and keep the plant in line with the demands of those markets?

Such a policy decision is necessary because foundry selling efforts must be directed along more definite lines than they have been in the past. Virtually every foundry sales staff develops inquiries which are outside the plant's capacity and ability. These are waste—like defective work.

Type of Market—Another policy decision, especially for small and medium foundries, concerns type of market to serve. Should it seek that which cuts across many different lines with a relatively narrow product range or that which offers a narrower market range with a wider selection of products?

The first type tends to be a horizontal approach that promotes and exploits specific products, alloys, or methods (product emphasis), whereas the second is a vertical approach which exploits the markets (market emphasis). It takes a fairly good-sized foundry organization to do both jobs at one time with assurance that it can continue such operations successfully year in and year out.

The horizontal approach demands specific casting process abilities. Marketing for such a product line usually is more expensive than for a vertical market. With a vertical market, foundry sales engineering staffs can penetrate more deeply into the problems of customer organizations and be ready to capture uses as new designs shape up.

Most of the larger foundry organizations work in a narrow market range. They seek constantly to refine their old products and always are alert for new developments that will maintain or improve their present position.

The profit idea, as the objective of marketing, calls for other policy decisions. For example, a foundry must know the profitable range for each of its work centers and must concentrate accordingly. One of the problems of the castings industry is that many of its members attempt to operate outside the profitable range of their ability. Many small foundry organizations make money by concentrating on either a range of casting sizes or a line of alloys.

Pound or Piece? — Further concerning profit, a foundry must decide whether it is going to make a profit on each job or on the customer's work as a whole. The latter sounds like the easier way out and usually ends up by the establishment of a flat per-pound price for a customer's product mix at any one time.

The long-run tendency, however, is for the original product mix to change gradually. The better jobs, which have carried the load, are peeled off and end up at a lower price in some other plant. A cost program must be sharp enough to permit unceasing vigil over such an account, and it is practically impossible to avoid periodic hassles with the customer.

The customer also misleads himself in the true cost of his own products because some castings are overpriced and others underpriced. He therefore is in jeopardy because he does not have a true cost on his product.

This sort of pricing arrangement implies a very close, ethical business relationship, one in which the foundry functions as an integral part of the customer's operation. But even then hazards continue to exist. Market decisions based on the maintenance of a product mix are possible, provided that it can be assured. The customer, however, buys what he wants, not what you want to make for him. A desirable product mix is a difficult thing to maintain in a rapidly changing world.

In an era when designs are changing rapidly, a saner method lies in individual costing and pricing. Remember, change is the only permanent factor in today's market.

Another marketing policy decision concerns the geographical area which can be served profitably. A thorough look at "selling costs" may show that some distant accounts are booby traps from the profit viewpoint.

Market and Product Development—Once the markets which the individual foundry can serve best have been determined, marketing gets down to brass tacks.

It will help to analyze the trend of each customer within his national market and especially to find out whether he maintains a consistent share of it. The next step is to find out whether or not your foundry maintains a consistent ratio of sales in that market by comparison with historical castings market curves. This analysis will show whether your company is on the way up, holding its own, or going down.

This question generates the need for another policy decision: Would it be wise to put all your eggs in one basket or to plan so that the loss of any one customer could not hurt too deeply? Dependence on one customer keeps the foundry entirely at his mercy.

All of the information acquired so far will permit a decision as to just what other markets are compatible with the policies established. In many instances, the product lines decided on will fit into several new markets that can be served without confusion.

After these decisions, it is easier to pinpoint desirable customers, whether or not they are such at the moment.

Market penetration also can be achieved with your present customers by extending their use of cast products by cashing in on product development.

Product Development—Misunderstanding as to the nature of product development has been evident in the attitude of the castings industry over the last few years. Product development is just what the words imply: The establishment of methods that will develop new or improved products.

First of all, product development is a job for the whole organization. The market executive has a strong voice in setting policies to guide product development because he must take the responsibility of determining what the market wants and what the company must do to exploit the markets it serves.

It is difficult to conceive of product development without a definite and planned effort within the company. This effort calls for some form of laboratory dedicated to the creation of new applications and the refinement of old ones.

Marketing loses its meaning completely without a good product. The product which is good enough today will not be so five years from now unless research and development improves it enough to keep pace with competitive technology.

Constant improvement of present products is fundamental to the idea of product development. For one thing, castings industry research is needed to accumulate property data that tell the complete engineering story of casting alloys. This is another area best served by group activity.

Design Responsibility—The castings industry has been reluctant to assume design responsibility. This attitude is a serious defect in past marketing practices. Such design responsibility brings about an engineering maturity which classifies castings as products, rather than as bulk materials. Product development and product responsibility are synonymous.

The foundry industry must assume engineering responsibility for design as a fee service to capture

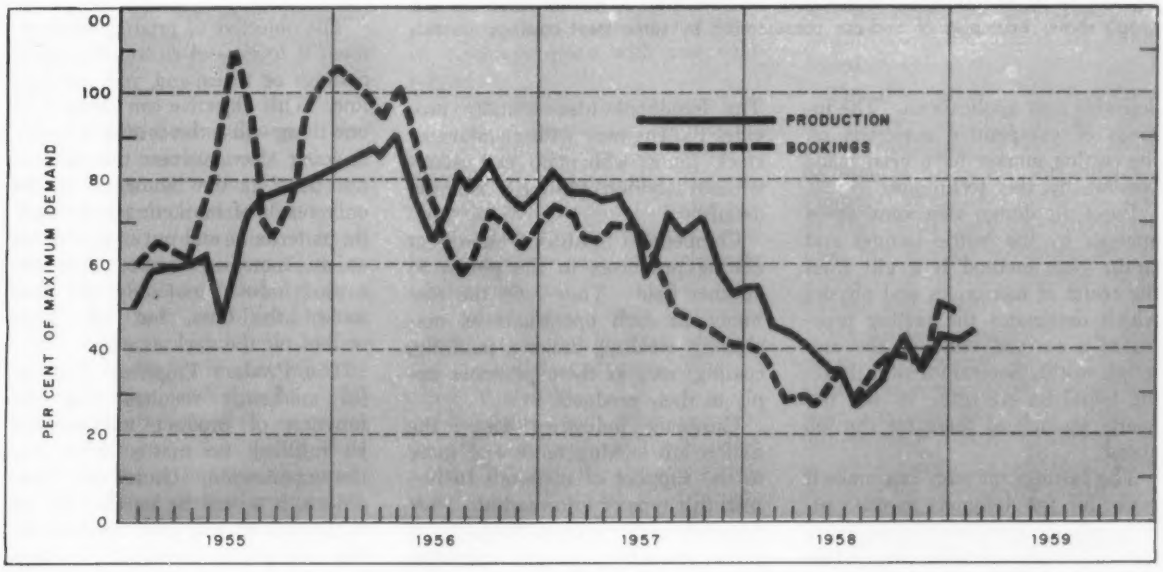

Fig. 3—Short-term business predictions are difficult to handle, but can be of great value. For example, as chart shows, bookings usually indicate what will happen to production in a month or so. Chart is based on SFSA statistics

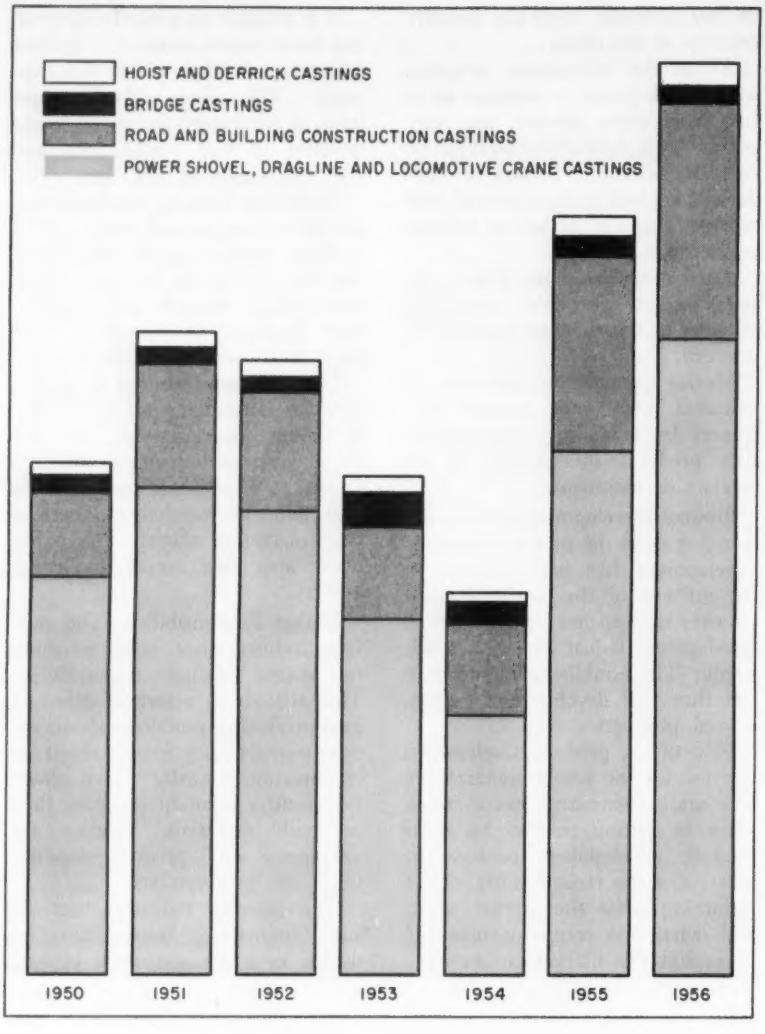

Fig. 4—The historical market record is an essential part of market research. Bar graph shows examples of end-use consumption by some steel castings markets

desirable new applications. The inroads of competitive materials on the casting market have been made possible by this technique.

From the design viewpoint, stress analysis by the brittle lacquer and strain gage method is a gift from the realm of mechanics and physics which designates the casting process as a favored child of the materials world. Several forward thinking foundries are using it—but not nearly enough of them for the job ahead.

The castings industry can make it easier for the designers to use castings and at the same time easier for the foundry to make them. This job calls for support of the research necessary to develop handbook data compatible with the casting process. The handbook idea actually provides the engineer with standard or stock items which he can adapt without laborious or time-consuming details.

Competitive industries have beat casting producers to the punch in another field. They help the customer in such operations as machining, welding, brazing, painting, coating, etc., as these processes apply to their products.

Customer industries across the nation are looking more and more to the supplier of materials to furnish this type of information. They naturally will lean towards those producers who can and will offer it.

Defining Quality—Product and market development require a realistic attitude about quality. The confused status of the interpretation of this word actually has created a situation of "product confusion" so far as castings are concerned. Quality is relative to the job at hand.

For example, some manufacturers want a part that will wear out or break down under certain overloads so that there will be replacement business. Quality for them certainly does not mean a part that never will wear out or break. Proper quality for such a customer differs from what it would be for some other application.

Producers of rolled steel define quality in terms which can be adapted to castings as follows: Cast alloys are made in several levels of quality, all of which may have the same chemical analysis and meet the same property requirements. The choice of proper level is in the hands of the designer, who must balance requirements against the end cost of the part and against claims or guarantees as to service life of his machine or assembly.

High quality frequently is specified because actual service conditions are unknown. Where service loads and conditions definitely are known, high quality is a means to lower safety factors and is justified variously by end cost, engineering economy, or critical performance requirements. It provides premium cast products that have a lower end cost.

The objective of product development is to expand customers' use of castings or to expand your product line. This objective can mean only one thing—that the casting industry is going after business that it does not have at the moment. If the only result of marketing is to shuffle patterns in and out of a foundry at an increased tempo, then the casting industry not only will have missed the boat, but will have walked off the dock as well.

The Product Engineer—Successful marketing requires that the function of product management be fulfilled, no matter what size the organization. Under ideal conditions, it would be handled by an individual with a staff function in the marketing division. In any event, his interests are directed to relatively specialized markets or product lines. This is one of the lim-

iting factors in a small organization. It circumscribes the company's market range.

For the castings industry, it is best to define this individual as a *product engineer*. His field of activity lies between assistance on the sales end and liaison with the product development, research, and production facilities of his organization. It is his job to develop a full knowledge of his market and of the product line which he is directing.

The product engineer should be the kind of man who can deal with customer engineers in an engineering sense. He should possess the ability to analyze customer operations and equipment so that he can guide casting design to suit both customer and foundry.

He should dig constantly for potential applications of cast products. These might be obtained through a plant visit, from parts books and maintenance manuals, and from trips to observe actual field applications of equipment. He certainly should be an active member of an appropriate engineering society.

This man also becomes a part of the customer service division of marketing. He accumulates and feeds data to the regular sales force and identifies what to look for on regular sales calls. The product engineer is thoroughly familiar with his own plant. He is able to avoid projects the plant cannot produce or does not want. At the same time, he counsels company management on potential profitable expansion of his particular market.

Keeping Casting Business

Product management involves some degree of strategy as well. There always is a sense of urgency in getting a product into service or making necessary corrections because of service conditions. Once a design has been established, however, there is a period of relative quiet. It is this cycle that must be watched very carefully. The customer organization, if it is on its toes, always has a few young engineers seeking to improve the product or to lower costs as a means of establishing their worth. There is an ever present drive within the customer organization to lower end costs and to achieve other engineering or market advantages. This drive may mean a loss of castings business. The foundry must keep ahead of the customer.

III. Sales Promotion and Selling

Market research finds where to go, and product planning covers market and product development. The next step is to go after the orders.

Promotion—Sales promotion is a common sense preliminary to a solid sales effort. It aims at the acceptance of the individual company and its product line. It is a door opener.

An old saying has it that "absence makes the heart grow fonder." In contrast, a more practical one says, "the one that is near is the one that is dear." Promotion develops the "nearness" inexpensively.

Many points that tie in with sales promotion have been mentioned previously. The field of promotional materials and techniques includes advertising; data sheets; descriptive literature about the product line; the capacity and ability of the foundry; case histories of successful applications; lectures before engineering and customer groups; customer-foundry conferences; and placement of full engineering and design data in the hands of proper persons in the customer organization,

We must recognize that some customers still are reluctant to admit the use of castings on the equipment they produce. A major promotional task of the castings industry is to establish a much higher degree of acceptance by the users of machines made with cast components.

Selling the idea that modern castings are materials for engineering service will make it easier to sell to the more direct customer. The customer of our customer dictates materials which the equipment producer and designer will use to overcome market resistance.

In other words, give your customer something to brag about—and potential customers will be easier to convert.

Advertising and promotion for the above purpose can be handled more effectively by a trade association group. The task is to initiate mental acceptance for the industry's products.

From an individual company viewpoint, advertising and promotional material more logically is directed toward the point-of-purchase customer. The function here is to gain company recognition and develop inquiries. At the least, to develop something besides a cold reception for your salesman. Sales start before your salesmen call.

Advertising also helps to support your customer's decision to use cast products. It is looked on as a symbol of success and representative of a dynamic company. It helps make it easier for your customer to use castings.

All advertising and promotional materials require just as much thought as planning the production of a casting—maybe more. Improperly handled advertising and promotion can be a waste of money. On the other hand, many worthwhile benefits also have been gained.

Selling and Sales—So far your market research and product planning have determined where and what you want to sell. Promotion has at least opened the door so that there is light showing on the other side. The market and the potential customers have been pinpointed. Selling strategy now comes into play.

The rolled products industries of the nation make use of market penetration methods that might be adaptable to the castings industry. From the SIC breakdown of county market patterns, the potential for any specific type of product can be reasonably established. Thorough investigation of potential customer product lines then refines this potential, and sales quotas are established.

This description of the technique is oversimplified, but the approach offers possibilities. It certainly could be used to set a par for the area. Foundry organizations with end product lines can use and have used this method to determine the location of branch plants, warehouses, and jobbers.

Marketing decisions up to this point will indicate or dictate the kind of salesmen or sales engineers your company will need. There is, unfortunately, little agreement as to what constitutes an ideal sales engineer for the casting industry.

The subject of selling is too broad for full coverage in this article, but one point stands out: Above all else, sell end cost or engineering economy. This course leaves the way open for a permanent relationship

with the customer. Selling on price alone creates the ultimate in temporary relationships.

IV. Customer Service

Customer service is one of the marketing tools which brings into play the performance of the plant. Proper handling of an order, meeting established standards in a consistent manner, and delivering on schedule are essential to the retention of present business and to acquisition of new business.

Production Schedule—Scheduling production in a jobbing foundry is a difficult task. Poor scheduling frequently can result in over-all loss, principally because of unabsorbed overhead resulting from inefficient use of manpower and equipment.

A plant producing standard items easily can schedule production so that stock is available as needed. In a custom foundry, however, effort must be directed toward achieving a similar condition while operating at a profitable level. For this reason it is recommended that the market manager have staff authority over the establishment of a desirable production sequence. The sales department and particularly the salesmen must bear the brunt of a customer's displeasure when schedules are not met.

This sequence schedule then has to be modified by plant production and rearranged for efficient operation. Then the sales department has a firm schedule to work with, and the plant must maintain that sequence to satisfy the customer service function of marketing.

By the same token, the sales department will be reluctant to seek schedule changes because it knows that each change will affect all other orders on the schedule and thus multiply its problems. Some changes inevitably occur, but they must be minimized by proper planning and co-operative effort.

Inspection & Testing—Marketing has the responsibility for establishing the quality level and acceptance standards for any given job. The more thoroughly this task is eccomplished, the less difficulty is encountered. Foundries lose a lot of money through misunderstandings as to just what the customer has purchased.

Machining—Visitors to Europe have reported back that most foundries there do some machine work on castings, even to the point of complete finishing. Most regard this service as the best single method of satisfying the customer. It certainly provides the finest means of nondestructive testing known. Even a rough machining service offers benefit to the customer in providing more accurate locating points for subsequent operations. American foundries might consider similar services.

Shipping—To perform the customer service function effectively, marketing must have some voice in the operation of the shipping department. The manner and method in which the foundry's products are to be shipped is a part of the understanding which the sales force brings in with the order.

Perhaps the greatest problem lies in short shipments. They occur in virtually every foundry. A simple method of at least starting the solution of this problem is to incorporate a "scrap expectancy" factor when the order is released to the foundry. Under present conditions, when the break-even point is creeping upward constantly, it is almost mandatory that production be on a standard-time or piecework basis. Added to this are the day-to-day problems of individual men, which determine their effectiveness. It thus is almost impossible to assume that there will be no carelessness and no scrap in a given run.

Foremen and superintendents usually are experienced enough to assign this scrap expectancy factor, at least until production history indicates a more accurate figure. In any event, a solution to this problem helps to keep the customer happy. In most instances he cannot

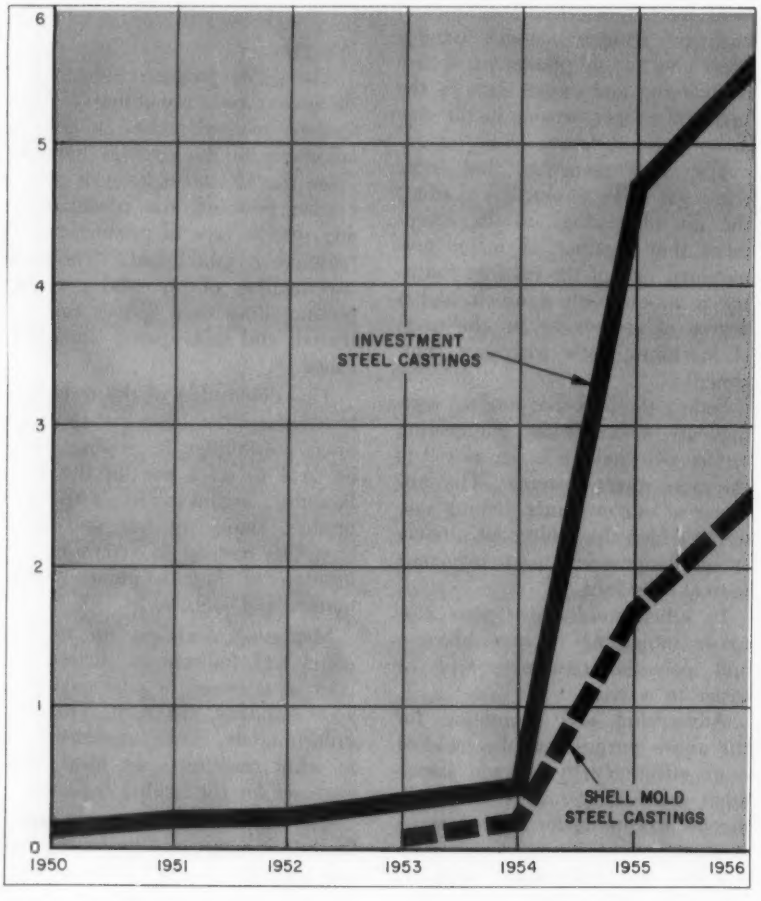

Fig. 5—Technological changes within an industry are vital to marketing. Chart shows increase in use of investment casting and shell molding by SFSA members

start his machining without upping his own costs until all castings are on the floor. Anything that adds to a customer's cost for castings adds resistance to his use of castings.

Production Assistance—This factor has been mentioned before under product development. It means simply that you are serving the customer by helping him with any of his own production problems that concern castings. It is possible, of course, to maintain that this job is up to the customer. But castings compete with other materials, and this sort of help is a means of making it easier for the customer to use castings.

V. Administration and Training

Company Size — Mention was made earlier about the effect of company size on marketing activities. Size does not restrict a foundry organization from devoting full attention to the principles of marketing. It determines only the length and breadth of a marketing program. Small firms should, for the sake of profit, restrict the number and range of its markets and products to those which it can handle profitably.

As size increases, the full force of a concentrated effort can be a profitmaker, expand uses, and create a more satisfactory situation by reason of a better defined and smoothly functioning organization.

The Market Executive—The man who handles the marketing program should be something more than the standard concept of a sales manager in the casting industry. He must use research methods, develop market and product policies, promote products and services, pinpoint potential customers, and serve them in a professional manner. This total resposibility can be summed up in a previously used phrase—*to produce the markets.*

This man works in a straight line and knows where he wants his sales staff to concentrate. He knows that fewer well prepared sales calls are more productive than many calls with poor preparation. He appreciates the special qualities of a good salesman or sales engineer and backs him up with engineering service. He does not measure his men by the tons or dollars of business they get but by net profit of their sales effort. And he knows the real cost of servicing an account.

Where To Find Him—For most foundry organizations, this man is a present member of the staff. It should be easier to develop a market attitude in a man familiar with the castings industry than to develop an understanding of castings in one versed in marketing. Look for a man who has demonstrated his ability to take responsibility, a man who has some imagination and is willing and able to learn something new.

Authority must be placed in his hands if he is to achieve results. This authority should encompass the whole customer discovery, contact, and service activities of the company. His range of interest and both line and staff responsibilities are shown in Fig. 6. For an excellent article on "Developing Marketing Men," see *Steel*, Sept. 22, 1958.

The ability to train himself is important. Background knowledge of statistical methods, market source material, engineering design factors and influences, cost and profit consciousness, and a few other spheres of knowledge need to be developed. Being an engineer will certainly help him, but intelligence is the necessary characteristic. Drive, curiosity, genuine interest in customers, tenacity, and patience all are important.

Training a Staff—Once this man is ready, he has the task of training his staff to fulfill their individual functions. A number of ingrained habits of thought and action built up from past foundry sales and customer contact experience will need changing or at least smoothing out.

Conclusion—Marketing is a frame of mind or mental attitude for a whole organization to adopt, from the directors and president down through the foundry and into the customers' plant.

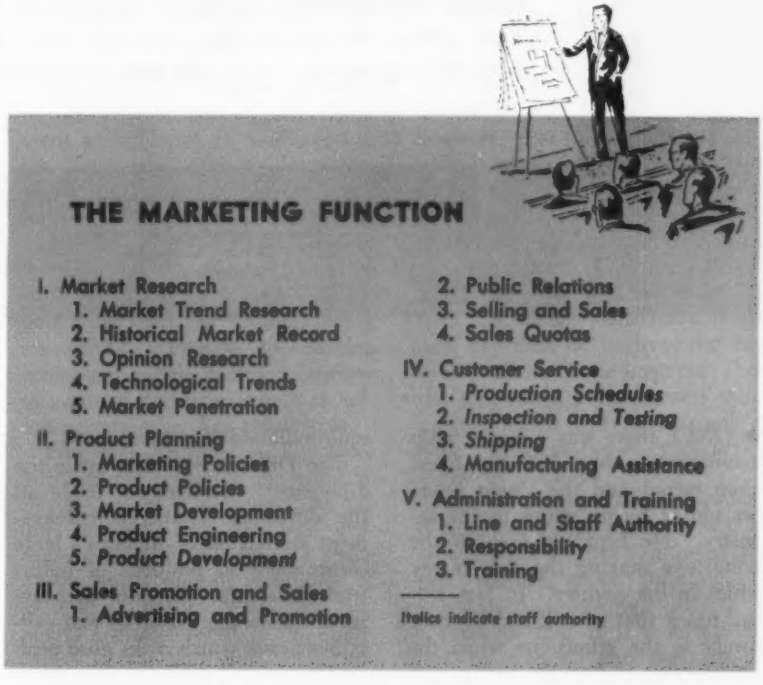

Fig. 6—Line and staff responsibilities of the marketing executive

Allen M. Slichter, president, Pelton Steel Castings Co., Milwaukee, in an address before the 1958 Wisconsin Regional Foundry Conference, stated, "We in the cast metals industry have a grand future if we don't boot it. What we do in technical and market research will go a long way toward telling the story."

The marketing approach is an important step toward realizing this opportunity. It is a common sense approach to more effective selling and company planning.

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OPERATION MARKETING

Managing a Foundry PROFESSIONALLY

Superior management enables a business to make profits even when its competitors cannot. This article analyzes the ingredients which are part of good management

By GLENN J. COOK
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Schenectady, N. Y.

● ONCE there was a buggy whip manufacturer who had the finest scrap record and the lowest hours per ton of buggy whips in the industry. He kept his nose to the grindstone making the best buggy whips in the country. In fact, legend has it that he still had his nose firmly to the grindstone when the sheriff came to post the bankruptcy sign on the door.

Down the street from him was another buggy whip factory. It made pretty good buggy whips, too, and had reasonably good costs. Even though profits were good and business wasn't too bad, the manager there got curious about the future. He saw the trend of buggy sales going down and automobile sales going up by leaps and bounds. It didn't take much investigation to convince him that the horseless carriage was around to stay, that buggies were on their way out, and that the market for buggy whips soon would dry up. So he converted his factory to automobile accessories and developed a profitable, multimillion-dollar business.

The Difference—What made the difference? Management made all the difference. Superior management steered all of America's large corporations to positions of industrial leadership. Superior management marks the foundries and other businesses which make good profits year in and year out even when their competitors are suffering rough weather. Each of you can improve your own management if you invest time and effort to becoming students of your business.

Here are four questions which will help you test the quality of your management:

1. Have you identified and do you give balanced attention to all key result areas in which you should be measuring your business results regularly? Or do you look just at the month-to-month profit picture?
2. Do you give well balanced attention to all functions of the business, or do you concentrate mostly on manufacturing and hope that the rest will come out all right?
3. How far ahead do your plans project?
4. Do you manage your own personal time, or does the job push you around?

Let's look at each of these questions individually and see whether each of us can't find opportunities to improve.

I. KEY AREAS

First, let's consider "key result areas" you need to follow closely and by which we should measure our progress. After considerable research, our company has identified eight such areas. We think that continued failure in any one of them will ruin or seriously cripple any business. These observations fit foundries as well as other businesses.

Profitability—The first obviously is profitability. If we don't make a profit, there won't be any tomorrow for our business because there won't be money for expansion,

improvement, and a fair return to the owners.

The other seven areas all are related to profits, but mostly they are concerned with results today that won't be reflected in profits or losses until next month, next year, or several years from now. They are market position, product leadership, productivity, personnel development, employee attitudes, public responsibility, and balance between short and long-range plans.

Market Position — In measuring the market position of your business, you attempt to determine what percentage of the available business you are obtaining. This figure can be measured in terms of how much of the total business of your principal customers you obtained. Other significant measures of market position are the ratio of your sales to the total sales of the applicable branch of the castings industry. If the ratio of your sales to the industry sales is declining, you are falling behind even though your dollar sales may be increasing. The fact that your share of the market is declining indicates that a deterioration has set in and that, sooner or later, profits and growth will suffer.

Product Leadership—A realistic measurement of product leadership discloses whether the business really is offering values to its customers on which a long-term profitable business can be built. Such questions as these should be answered with the greatest objectivity you can muster: 1. How does the surface finish of your castings compare with that of other foundries? 2. Do you control hardness as tightly as selected competitors? 3. Is your record for staying within specifications inferior or superior to or about the same as that of each of several competitors? 4. How does your present product compare with those of last year and five years ago?

Productivity—In measuring productivity, you try to determine the efficiency with which you are using the facilities and talents which have been invested in the business. Some of the measures which are pertinent are sales per payroll dollar, hours per ton of good castings, output per square foot of floor space, and output per dollar of investment. Comparisons with past months or years or with other foundries indicate whether you enjoy cost leadership.

Personnel Development—Results in the area of personnel development are difficult to measure, but are extremely vital to long-term success of a business. Simply stated, these results measure the extent to which the business is developing the managerial leadership and the other skills in people which will be required to keep the business going successfully. Failure to develop competent people dooms a business to eventual decline as surely as failure in any other key result area.

Employee Attitudes — Employee attitudes are critically important to the success of a business. At the one extreme, bad employee attitudes eventually can bring a strike which snuffs out all possibility of growth or profit. Favorable employee attitudes result in the application of the full skill, care, imagination, and efforts of the people in the business, with nothing held back. This factor is by far the most important determinant of productivity.

Public Responsibility — In the area of public responsibility you should recognize that you are allowed to stay in business only so long as the public and governments which represent it are willing that you continue. The first obligation is, of course, to observe laws and regulations not only to the letter, but in spirit as well. Beyond that, all of us have the job of being good citizens — individually and as a business. Still further, it is almost equally important that we communicate enough with neighbors, employees, government officials, etc., to become recognized as good citizens.

Planning—The eighth key result area we call balance between short and long-term planning. This factor also is too intangible to submit to precise measurement. We know, however, that if long-range planning is neglected, the business will drift. And when a business drifts, it drifts downstream — never upstream. Sooner or later, profits and progress suffer. Very occasionally a manager becomes so enthralled with long-range plans for a bright new day that he neglects the day-to-day affairs of the business. Then the long-range plans become misty dreams which will never come to pass. Progress comes from action a day at a time.

The far greater danger, however, is that long-range planning will be crowded out by fire-fighting activities, routine paper shuffling, or minor decision making.

I realize that it is a formidable task to examine and measure results in all these areas constantly. It is much simpler to boil down all the measurements to a quick look

FOUR TESTS OF MANAGEMENT

1. **Key Areas**—Have you identified and do you give balanced attention to all key result areas in which you should be measuring your business results regularly? Or do you just look at the month-to-month profit picture?
2. **Business Functions**—Do you give well balanced attention to all functions of the business, or do you concentrate mostly on manufacturing and hope that the rest will come out all right?
3. **Planning**—How far ahead do your pluns project?
4. **Managing Time**—Do you manage your own personal time, or does the job push you around?

at the monthly profits. But the professional manager can't feel satisfied with his results until he is sure that the business is sound and progressing in all these areas.

II. BUSINESS FUNCTIONS

The next major question leads most of us to another array of problems of which we are painfully aware, but probably give inadequate attention. It is this: "Are you giving balanced attention to all the functions of the business?"

Manufacturing — Most foundries with which I am familiar concentrate great attention on direct shop operations work and production scheduling and do an excellent job. Other important facets of the manufacturing function, such as quality control and manufacturing engineering, seem to get from fair to inadequate attention. On the whole, however, the manufacturing function tends to be the most developed and commands the lion's share of general management attention.

This leaves five other identifiable functions which require balanced attention. In our company, we refer to these as legal, finance, engineering, public and employee relations, and marketing.

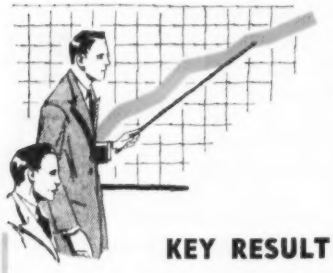
Legal—The legal work usually is not a serious problem because counsel can be obtained from a competent local attorney. One of my lawyer friends tells me, however, that many small businesses and some large ones look for legal counsel only after they are in trouble. Not so many make effective use of legal advice for preventive guidance.

Finance—Finance work includes accounting, credits and collection work, banking, and raising capital. In this area, failures in the bigger decisions can be fatal to a business. Most of these decisions get their share of attention. Some of the less glamorous facets of finance, such as cost accounting, appear, however, to get far too little attention. This condition continues to exist despite the efforts of foundry associations to point out the need for better cost information to guide selling price decisions. Too many foundries still price castings by the pound as if they were bulk materials such as coal or wheat instead of the engineered products which they are.

Engineering—Engineering in the foundry includes development of new products and processes. This work is gaining increased attention, but there are still few research and development laboratories in the industry. I feel sure that foundry industry expenditures for research and development are low compared with sales.

Public Relations — Work to be done in public and employee relations is so time consuming that a manager could spend all his office hours and most of his personal time on it. Such matters as union contracts, grievances, and wage rates get attention because they must, but not every foundry has an adequate health and safety program. And we all shrink from the huge task of adequately informing employees, community neighbors, government officials, and others whose good will and understanding we need.

Marketing—Finally, the function which seems to be in greatest need of more professional attention is marketing. In recent years, the foundry associations have stretched your imaginations with descriptions of the possibilities of improving profits through better marketing. You have recognized that marketing includes far more than just sales. Few foundries can feel satisfied that they are doing an adequate, well rounded job in this function. Surely, this is an area where we should be putting far more attention if we are to improve the prospects of our foundries.



KEY RESULT AREAS

Key result areas are those areas in the conduct of a business which must be followed closely and can be used to measure a company's progress. Continued failure in any one of them will ruin or seriously cripple any business.

1. **Profitability**—Without a profit there is no money for expansion, improvement, and a fair return to the owners.
2. **Market Position**—The percentage of the available business your company is obtaining is the measure of its market position. A declining share indicates that deterioration has set in.
3. **Product Leadership**—Measurement of this factor shows whether a business is offering values to its customers on which a long-term profitable company can be built.
4. **Productivity**—When you measure productivity, you determine the efficiency with which you are using the facilities and talents which have been invested in the business.
5. **Personnel Development**—Any business must develop managerial leadership and other skills in people which will be required to keep the business going successfully.
6. **Employee Attitudes**—By far the most important determinant of productivity, favorable employee attitudes result in the application of the full skill, care, imagination, and efforts of the people in the business.
7. **Public Responsibility**—You should recognize that you are allowed to stay in business only so long as the public and governments which represent it are willing that you continue.
8. **Planning**—Successful operation of a business requires a balance between short and long-range planning.

FUNCTIONS OF A BUSINESS

1. **Manufacturing**—Most foundries devote the lion's share of attention to the manufacturing function at the expense of the others.
2. **Legal**—Many small businesses and some large ones look for legal counsel only after they are in trouble.
3. **Finance**—Some of the less glamorous facets of finance work, such as cost accounting, get far too little attention.
4. **Engineering**—Engineering includes development of new products and processes, but there still are too few research and development laboratories in the foundry industry.
5. **Public Relations**—Most managers shrink from the huge task of adequately informing employees, community neighbors, government officials, and others whose good will and understanding their companies need.
6. **Marketing**—Of the six functions, this one seems to be in the greatest need of more professional attention.

It would be pleasing to believe that we could keep our noses on our manufacturing grindstones and do a good job. But the specter of the estimable buggy whip maker reminds us that these other urgent problems just won't go away unless they get our balanced attention.

III. PLANNING

The third sobering question is, "How long are your plans?" Do you operate on a day-to-day basis? Do you plan ahead a month, a quarter, 1 year, 10 years, or 20 years?

The value of a yearly budget of sales, production levels, cost, and expenses has been widely recognized in most businesses. Not so common, however, are plans that reach out 5, 10, or 20 years. Yet, when we make major investments in facilities, hire and develop key people, or authorize major developments, we are doing so on the basis of sales we hope to make 5, 10, or 20 years hence. Thus, we need to look into the future as accurately as possible.

Peter Drucker, the economist, pointed out that we don't need a crystal ball to see much of the future. We need only study the past, the present, and some facets of the future that are quite predictable. The most important statistics relate to people. Barring a major war or other calamity, we know fairly accurately how many people there will be in 1967 or 1977, what their age groups will be, and where they are apt to be living.

Labor Shortage Ahead—This one statistic shows us some alarming facts. Ten years hence we can expect a labor shortage. In the 1920s and 1930s, birth rates were low. In the 1940s and 1950s, they increased sharply. People also are living longer because of better food, medicine, and care. Hence, in 1967 there will be far more nonworkers under 18 and over 65 in the population and only a few more workers 18-65. We can estimate that 40 per cent more goods will need to be produced with only 14 per cent more workers and perhaps no more actual productive hours of work.

In these days of short work weeks and light production schedules, it may seem far-fetched to worry about a labor shortage several years hence. But to be ready to meet this problem, we must start now to plan for labor-saving machinery, to eliminate jobs which will be hard to fill, and to make all our jobs more satisfying and attractive in relation to other industries which will be competing for workers.

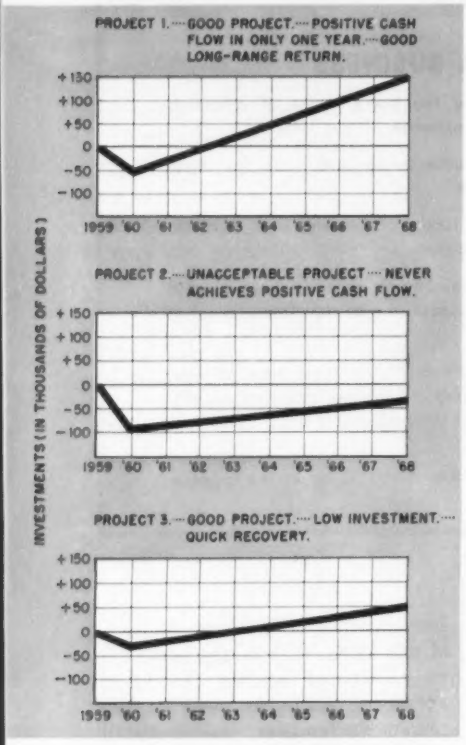
Investment Planning—Decisions regarding investments in plants, equipment, and development projects place a special premium on sound, long-range plans. Such decisions involve risk taking of a high order. Once funds are committed to investment projects, they become relatively fixed and immobile. Wrong decisions can be revised only at great loss. The character of the business and its chances for profitable operation five years or ten years from now can be established irreversibly by a few major decisions of this kind. Risk taking never can be eliminated because the future actions of people can never be fully predicted; however, the probabilities of success can be improved greatly by sound, long-range business plans.

Very briefly stated, these are minimum essential foundations for investment plans:

1. *Sales forecasts for each of the next five years and for the probable sales level in ten years*—In their simplest form, such forecasts might be developed just by putting into organized form the consensus of the most knowledgeable people in the organization. Even this step would result in more accurate forecasts than are available to guide decisions of some foundries.

Additional study of national and local population trends, industry location movements, business trends in the industries in which principal customers are located, growth experience and expectations of principal customers, product plans of large customers, and other readily obtainable data will permit considerable refinement of the projections.

2. *Formal, written product plans*—No foundry can make every kind of casting best. In times of low volume, there is a temptation to try to spread talents, equipment, and other resources over too broad a range of products. In better times, it may seem good short-range strategy to throw out all but the most profitable business. Long-



Cash flow charts are convenient means of comparing different investment opportunities

range, formal, written product plans are insurance against costly and ineffective vacillation.

New products and processes appear constantly. Decisions to make a new type of casting or to cast a new type of metal trigger large commitments of money and talent. They should be made only after careful study of the probable potential business that might be available. Also to be considered are such factors as the technical competence, know-how, foundry skills, and equipment which the business has available to apply to such a product. Once a decision has been reached, it should be incorporated in written product plans. These should not be changed except after equally careful reappraisal.

3. *Financial appraisal of investment proposals*—Since no business has unlimited investment funds, it is necessary to evaluate carefully alternate needs and opportunities for investing funds. An evaluation of investment opportunities should include these factors:

a. Insistence on several proposals for meeting each specific need or opportunity. If a new molding machine is being considered, for example, several different types and makes should be studied.

b. An analysis of the probable effect on the profits of the business which could be expected from each proposal. This involves making estimates, based on the best information available, of savings in labor, material, and overhead (burden) expected from each proposal; of new sales volume, if any, expected from each proposal, with estimates of profit for each; of estimated investment required for each; and of added expenses such as rearrangement of equipment, starting costs, training expenses, and other nonrecurring expenses related to each proposal.

c. A chart for each proposal showing the flow of cash by years. Outgo would include cash required for investment and related expenses. Income would include added profits resulting from savings or from profits on added sales made possible by the investment plus depreciation on new facilities.

Cash flow charts like those accompanying this article are a convenient means of comparing different investment opportunities. Project No. 1 would be an excellent long-range project. Incoming cash flow starts to exceed outgoing cash in a little more than a year after the expenditures. Sizable long-term cash increments are achieved with reasonably low investment. Project No. 2 offers some savings, but they are so low in relation to the required investment that the cash flow is still unfavorable after ten years. Project No. 3 is an example of a good project with both moderate investment and moderate savings. The relationship of savings to investment is favorable and produces a quick return of the cash invested.

The competitive future of our products, our readiness to serve expanded markets, and a host of other problems require long-range plans. The alternative is to drift, and to drift means to float downstream.

IV. MANAGING TIME

The enormous needs of our businesses for attention to all the eight key result areas, to the six major functions, and to longer cycle planning represents a staggering work load for the manager. This load can prove unmanageable unless you learn to do a better job of managing your own time. The most difficult of all managing jobs, it is by far the most important.

This job requires, first of all, a firm resolve to manage the job and not let it push you around. If you don't think the job is pushing you around now, try this simple test: Ask your secretary to keep a simple record of your time for two weeks. Have her record the time you spend alone—thinking or reading. Record time in conferences. Keep a separate record of interruptions in person or by that persistent interrupter, the telephone. Then analyze the record to see how much time you are giving to your subordinates, customers, and others. See how little time you had under your own control, how little time you had, without interruptions, for reading and thinking.

When you subtract the time you spent in routine reading, you may be dismayed how little time there was to think and plan. It won't surprise you then that you haven't done as much long-range planning as you would like.

What can be done about it? Your analysis probably will suggest several things. Too much contact with a single subordinate may mean that you haven't delegated enough and are trying to do his job as well as yours. Or it could mean you are using him as a leaning post.

Too many interruptions may mean that many people are relying on you for decisions which should be delegated to self-reliant associates. Too many interruptions may mean simply that you and your associates need to organize your contacts better. This job can be done readily if each person accumulates several matters for discussion at planned intervals instead of coming in with individual problems.

Most important is to decide what things you need to do and what things to delegate. Then plan your time with appropriate provision for time each day for thinking and planning.

Be sure you don't imitate the buggy whip manufacturer who did a good job on the things he knew how to do best, but went broke doing it.

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ACHIEVING PROFITABLE GROWTH

Suggestions are made for developing growth potential of foundry business. They include, as indicated at the left, use of market and process research and institutional advertising

By GREGORY M. BONI
Senior Partner
Touche, Niven, Bailey & Smart
New York

● IS MANAGEMENT doing all it can to develop the growth potential of the foundry industry? To answer this question management must consider many factors.

First, it must ask itself whether or not its company is performing as well as other companies in the industry. The answer can be found by comparing the rate of profit on sales and on investment of your company with other companies, and by comparing the rate of growth. Is your company earning as much as your competitors? Is your company getting an increased share of the market, or is it losing a share of the market?

The next question which management must ask is a broader one. Is my company and are my competitors carrying on practices which will hinder the growth of the industry as a whole? A product may have inherently good qualities, but inadequate management practices can slow up or even prevent the growth of an industry.

Are foundries spending adequate money on research and development? Are they reducing criticism of their product and making possible expanding uses for it? Are the pricing policies of the industry such that adequate profits can be earned to permit necessary marketing and technical expenditures? Is competition being carried on in an uninformed manner so that the industry as a whole finds it difficult to make progress? Management has an obligation to its own company as well as to the industry to manage its company in an informed manner.

Planning for Profit — Planning, when modern techniques of management science are used, is management's new secret weapon. An over-all plan for profit differs from forecasting. Forecasting is an important part but only a part of planning. The forecast is made to present in analyzable form the dollar effect of carrying out the first plans of management. After a forecast has been prepared, the more difficult and extensive planning steps must be undertaken before the result can be called a profit plan.

The profit results in the forecast first must be compared with the profit objective of management. A realistic objective implies a comprehensive knowledge of the market in which you are selling, the behavior of your costs at different volume levels, and the strengths and weaknesses of your company.

Alternative steps must be considered to bring results of the forecast within profit objectives. Shall the selling effort be increased? Shall prices be raised or lowered? Shall a research and development program be instituted to broaden the base of the market? Or, contrarywise, shall overhead cost be reduced? Shall programs be curtailed? Shall capacity be decreased?

These questions must be asked in an orderly manner and the implications upon profit computed before decisions are reached. The effect of these decisions can be translated into forecasts of revenue and costs. Hunches can not be removed entirely, but knowledge can be found to take the place of many hunches. Perhaps the greatest value in orderly planning is that

"All segments of the organization must be informed of their responsibilities in carrying out objectives of the profit plan."

decisions are made by managers meeting the problem rather than by defaulting to it.

Need Information System—When an over-all plan is adopted, specific plans are made for controlling operations to achieve the objective. The efforts contemplated are measured against the skills of the organization, the manpower available, and the authorities and responsibilities which have been delegated. All segments of the organization must be informed of their responsibilities in carrying out objectives of the plan.

Furthermore, the company should have an information system which permits the measurement of accomplishment in relatively short periods of time. Such a system will enable management to know whether its plan was faulty, or whether individuals did not perform in accordance with the plan. The information system must compare accomplishments with objectives in the areas of finance, quality of product, research and development, technical progress, and facilities utilization. Objectives should be translated into financial budgets for each organization segment to facilitate success of the plan.

Use Dynamic Pricing—The essence of planning is to consider an alternative course of action which will permit the company to meet its profit objective. One course of action is to use dynamic pricing.

Dynamic pricing does not contemplate maximum volume but maximum profits. If management is to use dynamic pricing it must know what selling price will yield the greatest profit in light of the resulting volume.

To compute the effect upon profit of different selling prices, two things must be known: The total revenue from sales which will be obtained at different price levels, and the effect of the different volume levels upon cost. The necessary information about cost generally is not available in the customary financial accounting system. Neither is it generally available in the data commonly used for estimating.

Management must be familiar with the way costs behave as volume changes. It is not appropriate to consider that only direct labor and direct material costs change with fluctuations in volume, nor is it appropriate to consider that the overhead percentage relationship to these costs will remain constant.

Although direct labor and direct material costs vary proportionately to volume, rent or facility costs should increase only as a result of large changes in volume. Other costs do not increase in direct proportion to volume increases but increase at a slower rate than for labor and at a faster rate than for rent. The management which considers all of its costs, except direct labor and direct material, as fixed, faces the problem of creeping overhead.

Growth a Factor — As business grows, profits do not materialize necessarily, because increased overhead costs may eat up the increased revenue from sales. The data in Table I, taken from the "Survey of Sales and Profits in the Investment Casting Industry for 1955 and 1956" prepared by the Investment Casting Institute, provide an example.

An interesting fact stands out in the table. Companies with sales volume of between $300,00 and $1 million in 1955 and 1956 showed poor operating results compared with companies in the other two classes. It also is interesting that the highest rate of profit on sales is earned by companies with sales under $300,000.

There appears to be a strong inference that creeping overhead catches up with companies as their volume exceeds $300,000. It also appears that until sales exceed $1 million, investment casting companies go through a stage characteristic of many industries: They are not small enough or big enough to make adequate profits. The author's conclusions in this area are strengthened somewhat by studying the individual classifications of cost set forth in the institute's study. It appears that the main difference in the cost groups lies in the cost of supplies and "all other" production costs. These, of course, are the two areas in which creeping overhead would manifest itself.

TABLE I—Sales and Profits in the Investment Casting Industry

Sales Category	% of Indirect to Direct Labor		% of Profit to Sales	
	1956	1955	1956	1955
Over $1 million	18	19	7.2	4.9
$300,000 to $1 million	11	13	3.7	—3.6
Under $300,000	17	15	9.1	9.2

Know Cost Behavior—The problems of determining cost behavior in the foundry industry are not simple. If management is informed on cost behavior in only the few cost areas discussed below, it will have a competitive advantage.

The specific casting yield from any one pour cannot be anticipated within a narrow range. Accordingly, management is faced with the possibility of not knowing whether the yields in making certain types of castings will result in the average yields upon which cost estimates are based. A control program will provide information on the range within which casting yield must fall to average out properly with the cost estimates.

Another important cost behavior factor is the effect of different utilization of plant and labor facilities by different products. If, for example, you contemplate accepting an order which would utilize 30 per cent of your foundry capacity but only 5 per cent of your finishing capacity, what effect would this have on costs? This problem is complicated by the fact that it involves a study of probabilities of getting orders which would have the reverse ratio, namely, another order to utilize 5 per cent of your foundry capacity compared with 30 per cent of your finishing capacity. This probability, in turn, changes, depending on how close to the capacity your total orders are. New management science or mathematical techniques are available to cope with this problem.

Overhead cost behavior, discussed previously, can present a problem when it begins to increase due to greater production volume. When will you need more formal and extensive production control records? When will you have to increase the number of production control clerks? How many invoices can be handled by your existing bookkeeping department? How many foremen will you need for increased volume? When do you have to add a metallurgist to your staff? Each item of cost must be studied carefully and classified in such a manner that computation of cost may be made over the entire range of possible volumes.

The extended discussion of cost problems may have led you to infer that dynamic pricing means determining cost and then adding a fixed percentage to the cost. This is not the case. Cost does not determine selling price. Cost is the tool for measuring what the profits will be from a given selling price on an anticipated volume to determine whether or not you want the business. The selling price must be determined on what the sales revenue, not for one item but for the total volume, will be at different sales prices. The cost indicates whether this is or is not a satisfactory relationship. The answer may show that you must find ways to lower cost if you are to stay in business.

What About the Market?—A realistic profit objective must be based on a thorough understanding of whether the industry's market is growing, standing still, or declining. If foundry industry growth is approaching its top, then your survival will depend on holding your share of the market against competitors or on taking away a share of the market from your competitors.

"Do you have pricing policies which force the industry into a competitive profit squeeze?"

Taking business from competitors is not as easy as participating in a growing market. It can affect your cost structure significantly as you embark upon the hard sell era. Facilities capacity, skills, and the other factors with which you are concerned in planning, must be geared quite differently. Is your industry going to become one of small companies fighting big companies to capture an existing, relatively stable market?

If, on the other hand, the industry as a whole can expand, it is self-evident that each foundry will benefit. It, therefore, behooves you to think in terms of promoting the industry as a whole. Are you allocating sufficient monies to carry on market research? Are you following this with an adequate budget for process research so that your products can be used in more areas and make it easier for the industry to expand?

Are you providing an adequate budget for institutional advertising so that customers in new markets can be educated about your product? Do you have pricing policies which will force the industry into a competitive profit squeeze, making impossible these necessary expenditures? Does the industry have uninformed competition which can affect the rate of growth of the entire industry? The effect of price cutting goes farther than the mere loss of margin to the individual company.

Costing Policies—A competitor's reaction to your price change affects your volume. If you lower your price and your competitor does likewise, there is no reason to believe that the lower price will increase your volume. If, however, the lower price is healthy in relation to the cost structure, your costs can be used as a guide as to what your competitor's cost may be. Then you can adopt a much more informed strategy. But, unless your basis of costing is similar to that used by your competitor, it will not indicate what his reaction may be to a change in your price.

Many industries have adopted uniform accounting practices so that industry reporting, without disclosing the results of specific companies, can be most useful. Companies using uniform methods for allocating costs can make intelligent comparisons with association reports to judge their relationship to their competitors.

Editor's Note: This article is based on a paper presented at the Investment Casting Institute annual meeting in New York, November, 1958.

• For an extra copy of this article, until supply is exhausted, use card on Page 53

OPERATION MARKETING

GOOD CASTING DESIGN

. . . Can Mean More Sales

Good design is closely related to sales and marketing success because it can lower cost and improve both appearance and performance

By JOHN L. FLITZ and DONALD F. RICHTER
Central Foundry Div.
General Motors Corp.
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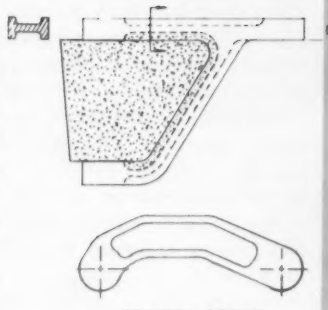


Fig. 1 (above)—As submitted for casting, suspension arm needed large core and could not be formed in green sand.

Fig. 2 (below)—Revised design eliminated core, permitted use of green sand

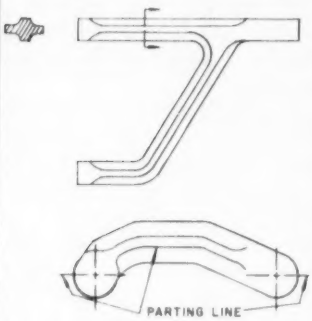


Fig. 3—With high-production molding techniques, it is desirable to place gate and feeder at the parting line

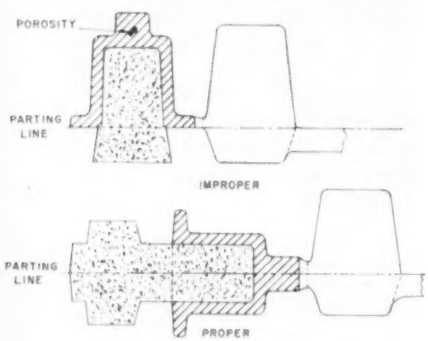


Fig. 4—As shown here, parting line should pass across core openings if they extend through a vertical wall

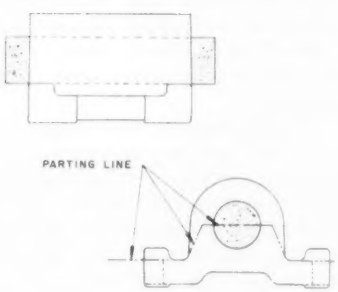
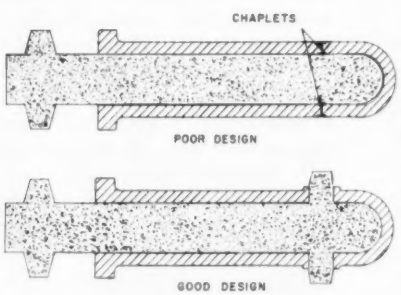


Fig. 5—In top design, core in mold is not supported adequately. Lower design gives better support for core



● THE PRIMARY requirement of a good casting design is that it will satisfactorily perform its intended function. In addition, keeping the cost of the finished product to a minimum is vitally important. To accomplish this, there must be an exchange of ideas between the designer and the foundryman. Let's consider some simple examples of what can be done.

Fig. 1 is a suspension arm as first submitted to us for casting. Because of the I-section construction of the arms in the direction indicated, it could not be formed entirely with green sand. A large core would be required to form the area between the arms, with green sand forming only the outer portions. The parting line extends across the upper arm as shown.

Fig. 2 shows the revised design suggested by our engineers and approved by the customer. With this design, it was possible to part in the other plane and eliminate the large block core. Note the I section has been changed to an X section to permit making the arms in green sand.

An important consideration of proper casting design is the parting line determination. With high-production molding techniques, it is desirable to place the gate and feeder at the parting line. Heavy sections, therefore, can best be fed if placed at or near the parting line. In the upper illustration of Fig. 3, the parting line has been placed at the flange. The heavy boss at the top becomes isolated from the feeder, and porosity results. This porosity was eliminated by parting in the other plane, which permitted the feeder to be placed directly on the heavy boss, as indicated in the lower illustration.

Cores a Factor—Cores also affect the parting line location. The parting line should pass across those cored openings that extend through a vertical wall in order to afford a way to place and support the core in the mold. This arrangement is illustrated in Fig. 4.

If the hole did not exist, the parting line would extend around the flange in a flat plane.

The parting line should be kept away from chucking and locating areas to assure accurate machining. When chucking or locating points are known by the casting user, they should be indicated on the blueprint so that the foundry can avoid these areas when the parting line is determined.

The parting line should be as flat as possible to simplify molding and pattern equipment and provide a casting with a minimum of fins.

After the parting line has been established, draft must be added. The normal draft in green sand molding or coremaking is 2 degrees, although in some cases, 1 degree can be used. In shell molding, draft angles as low as ¼ degree can be employed. Where possible, deep green sand pockets should have generous draft angles to preclude the use of cores.

Provide Core Support—When a core is necessary, the casting should be designed so that adequate openings are allowed through which the core can be supported in the mold. This will assure good location of the core and sufficient mold contact for proper venting. The design shown at the top of Fig. 5 does not afford a good means to support the core in the mold, so chaplets must be used. A chaplet is utilized only as a last resort because of the additional cost involved and because there is a possibility that the casting will not be pressure tight in the chaplet area. The openings shown in the lower design form a much better means of supporting the core, and, in addition, the holes provide a convenient escape for the core gas formed during pouring.

Castings should be designed to eliminate the need of cores whenever possible. Often, proper design

Fig. 6—Original design (left) of a truck wheel hub presented problems. Improved design (right) solved them

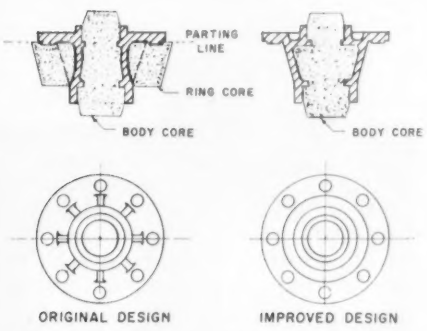
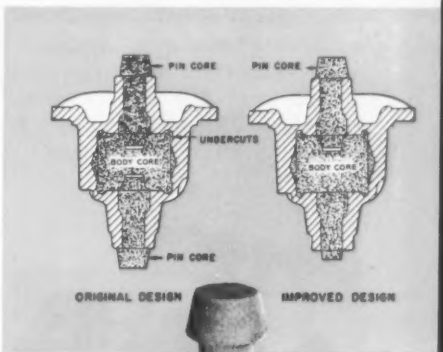
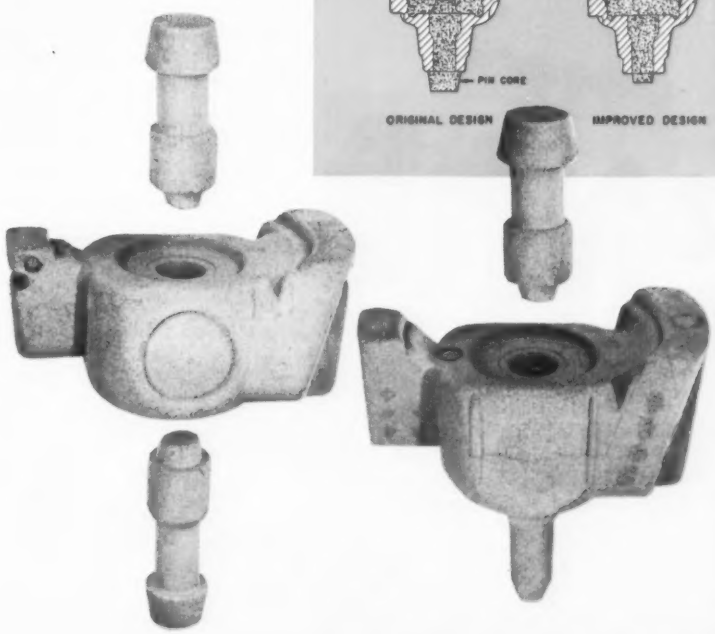


Fig. 7 (right)—Improved design, on right, reduced number of cores required for differential case. Fig. 8 (below)—The actual cores involved (improved design again on the right)





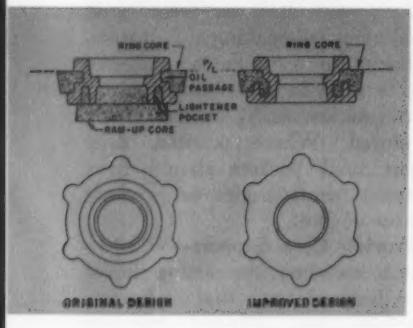


Fig. 9—Thrust bearing housing. Original design is on the left

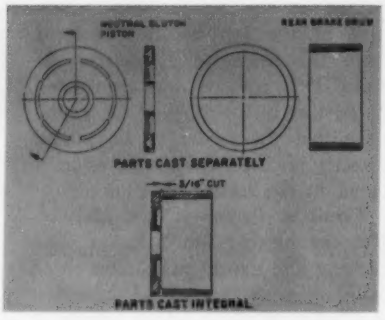


Fig. 10—Good design combines parts in one casting (bottom)

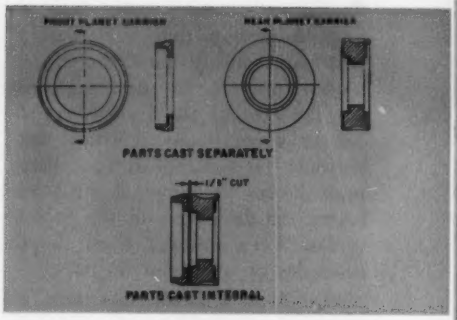


Fig. 11—Two gray iron stator blade carriers were combined

can combine or eliminate cores, resulting in a less expensive casting. If cores are necessary, it's wise to make a single core do as much work as possible. To illustrate:

The original design of the truck wheel hub shown in Fig. 6, had eight external ribs extending radially from the central body portion. Because of the shape of the body portion, the exterior of the casting could not be formed in green sand. A large ring core was necessary, together with the body core that formed the inner portion. The design on the right was improved considerably by enlarging the body portion to eliminate the ribs and the backdraft. With this design, it is also possible to cast the external portion of the hub in green sand. The large ring core has been eliminated.

Fig. 7 is another example of how improved design can reduce the number of cores. It is the design for a differential case, a major component in an automotive rear axle.

This part originally was designed with undercuts above and below each pinion bearing seat. These undercuts required a four-section corebox that slowed down and complicated the coremaking procedure. Separate pin cores were needed to form the tubular portions at the top and bottom. Our engineers recommended that the undercuts be filled in, as shown in the figure on the right. No other changes were made.

The body core now requires only a two-section, rather than the complicated four-section, corebox. The lower pin core was made a part of the body core. The upper pin core was not incorporated with the body core because there was a problem of getting good support from a core dryer while baking the core. Fig. 8 shows the actual cores involved.

On the left in Fig. 9 is the original design of a thrust bearing housing. It has a deep circular lightener pocket on one face and a circular oil passage opening to the outside diameter. Since the pocket is too deep to make with green sand, a ram-up core is required to form it, and a ring core to form the circular oil passage. Because the pocket is merely a lightener, and the oil passage is functional, Central Foundry engineers suggested that the oil passage be combined with the lightener as shown in the diagram, top right. The new design is no heavier, yet requires only one core.

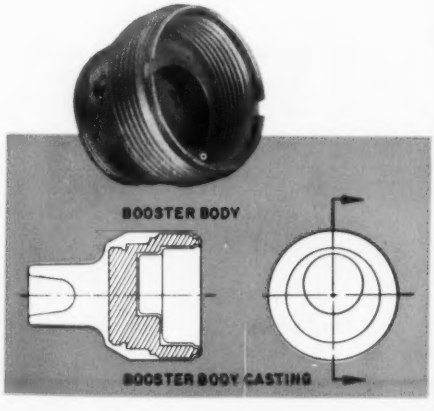
Combinations Cut Costs—Better design can effect substantial savings in other ways. By combining more than one finished part into a single casting, molding and handling costs can be reduced since fewer castings need to be made and handled. Following are a few examples of this practice.

A neutral clutch piston and a

Fig. 12—Single casting combines five bearing caps in a single casting which is machined almost completely as one piece, then is separated

Fig. 13—In another combination, several rocker shaft brackets are cast together

Fig. 14 (top)—Booster body was produced from brass bar stock. Fig. 15 (below)—Malleable body machined on same automatic units



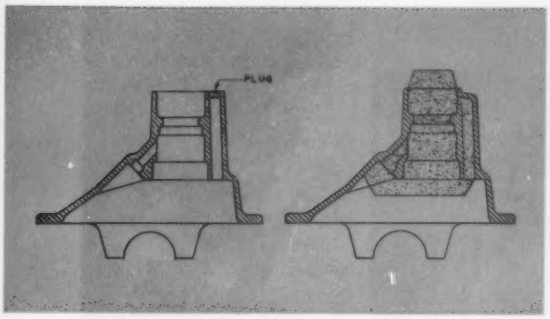


Fig. 16—Drilled oil passages, as on left, are cheaper in this part

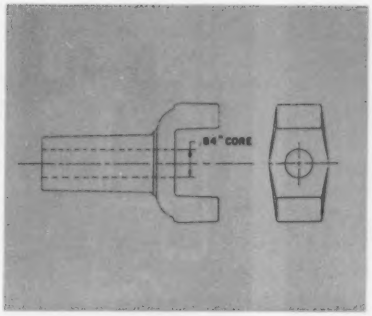


Fig. 17—In this part, coring is cheaper than the cost of drilling

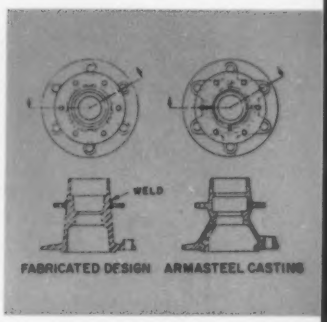


Fig. 18—One-piece casting is superior to fabrication (left)

rear brake drum for an automatic transmission can be combined in one casting as shown in Fig. 10. This arrangement results in fewer chucking operations, and the distortion due to chucking pressures on the rear brake drum will be eliminated, because this part can be machined while the casting is chucked on the neutral clutch piston. These parts are separated by the casting user during machining operations.

Fig. 11 shows a combination of two different gray iron stator blade carriers in a single casting. These parts are also separated during machining.

A single casting which combines five bearing caps used in a V-8 engine is shown in Fig. 12. Substantial savings are realized in both casting and machining costs. The casting is almost completely machined as a single piece, and the parts are separated in a final operation.

Fig. 13 shows how several rocker shaft brackets are combined in a single casting.

Consider Machining—If the lowest finished part cost is to be attained, good design of castings must often take into consideration machining operations. The booster body shown in Fig. 14 was employed during the Korean War in several different-sized artillery shells. The material, originally brass bar stock, was converted to malleable iron after extensive testing. In the conversion, however, the machining source wished to continue using the same automatic screw machines employed on the brass. This problem was solved (Fig. 15) by adding a 1-in.-diam by 1.25-in.-long lug for holding in a collet-type chuck. The booster body could then be machined completely during a single chucking and removed from the lug while machining the back side.

Engineers frequently are faced with the decision of specifying cored holes or drilled holes. Often these holes are oil passages, but they may be merely lighteners or material removed prior to boring or reaming operations. As an example of the economics involved in cored vs. drilled holes, examine the cross section of the differential carrier in Fig. 16.

The casting now is made without a core. The oil supply hole on the left and oil return hole on the right are drilled in the machine shop in a separate operation. If these holes were cast in the foundry, a core like the one shown in Fig. 16-A would be used. The small metal plug would no longer be necessary. However, a special shot blasting operation would probably be required in the foundry to insure that the passages would be free of sand. In this instance, it is cheaper to drill the passages.

The opposite is true in the example shown in Fig. 17. This part is an automotive universal joint yoke. Now a pearlitic malleable casting, it was originally made as a steel forging. The hole was forged solid, and a rather slow drilling operation was necessary to remove the material. One advantage of the casting is that the hole can be cored. A core drilling operation still is employed, but it is much faster since most of the material already is removed.

Machining costs are less with a cored hole, of course; and, in this case, the value of the metal saved is greater than the cost of the core. The casting, therefore, is less expensive with a cored hole than with a drilled hole. If the cored hole were much smaller, this would not be true, since the core cost would be relatively constant while the value of the metal saved would be reduced in proportion to the volume of the hole. As a general rule, it is often cheaper to core the larger holes if an appreciable amount of metal can be saved, or if machining operations can be speeded up or eliminated. It is usually more expensive to core the smaller holes, unless an unusually large amount of machining expense can be saved.

Conversions to Castings—A fab-

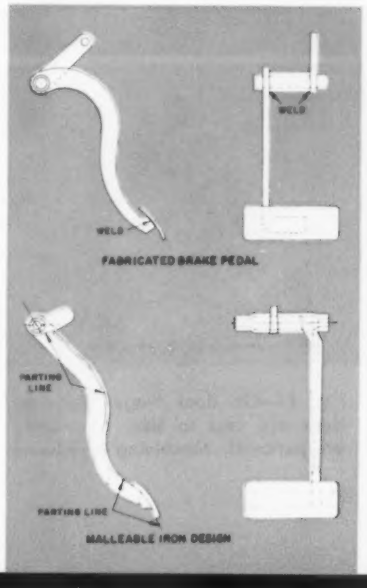


Fig. 19 (top)—Fabricated brake pedal is made of four separate pieces with three welded joints. Fig. 20 (bottom)—Made as malleable casting, brake pedal costs less, looks and operates better

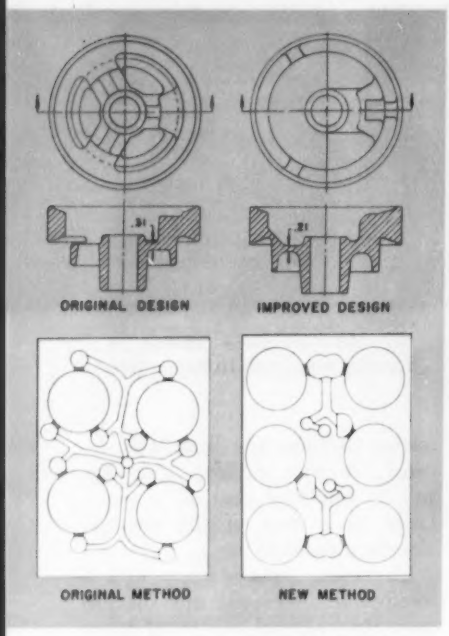


Fig. 21 (top)—Crankshaft pulley as originally designed (on left) and redesigned (right). Fig. 22 (bottom)—Original mold layout is left, new one on right. Redesign saves 15.6 cents on each casting

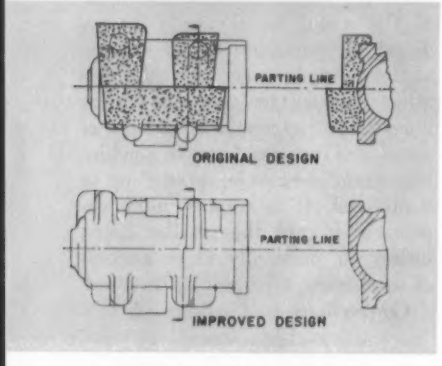


Fig. 23—New design for this power steering housing (bottom) does away with expensive undercutting

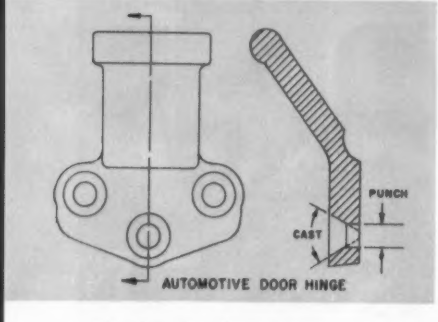


Fig. 24—On door hinges, countersinks are cast to size, and holes are punched. Machining is reduced

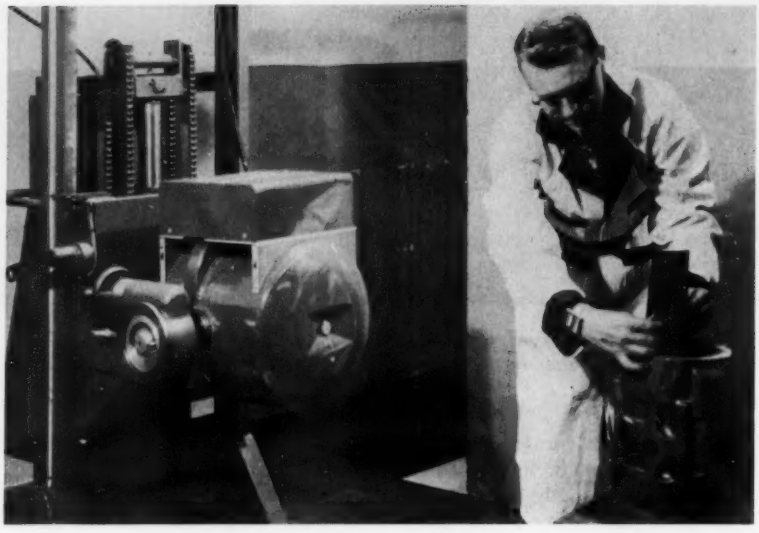


Fig. 25—Cobalt source is housed in a small, stainless steel capsule in the center of 1000-lb lead container. It is handled completely by remote control

ricated design of a rear wheel truck hub is shown on the left in Fig. 18. It consists of a forged base, with a steel plate welded in place, forming the smaller flange. The casting on the right is of single-piece construction. It is lighter, stronger, and less costly than the fabricated design. The fitting and welding of the small flange has been eliminated as well.

Another example of a conversion to a casting is a pendulum-type automotive brake pedal of welded steel construction (Fig. 19). Four separate pieces are used, with three welded joints. To replace this pedal, Central Foundry engineers designed the malleable iron casting in Fig. 20. The advantages include improved appearance, greater strength and rigidity due to single piece construction, and lower cost. Fitting, welding, and some machining operations have been eliminated.

Following are several other instances in which improvements in design resulted in lower foundry cost.

The crankshaft pulley at the left in Fig. 21 consists of a central hub connected to the outer groove portion by three spokes, each 5/16 in. thick. There are two major disadvantages to this design. First, it was necessary to remove parting fins from the windows between the spokes. This was an expensive operation. Second, three gates were necessary to produce a sound casting.

In the new design, right in Fig. 21, the spokes and windows have been replaced by a thin web. This change did not increase the weight of the casting. It eliminated the parting fins and improved the feeding characteristics to the extent that the number of gates necessary was reduced from three to one.

Fig. 22 shows another advantage of the new design. On the left is the gating or mold layout for the original pulley which required three gates. The excessive space taken by the feeders and runners limits the number of casting cavities to four. With only one gate per casting, as shown on the right, it is possible to get six casting cavities in the mold. This mold layout also improves the yield. The total cost savings with the new pulley design was 15.6 cents per casting.

Space a Factor—Sometimes it is impossible to redesign for lower costs because of space limitations in assembly or production line considerations. For instance, it was realized that the undercuts on the projecting mounting bosses on the power steering housing shown at the top of Fig. 23, were costly. They could not be formed in green sand because of the direction of the part-

ing line. Three cores were necessary to form the four bosses—two ramup cores in the cope, and a core in the drag. Bosses that eliminated the undercuts could not be utilized until recently, however, since the necessary automobile frame clearance was not available.

The new design at the bottom of Fig. 23 employs mounting bosses without the undercuts and corresponding cores. This improvement was possible and is now in production, because of modifications in frame clearances on the newer cars.

Automotive door hinges have been made from malleable iron for many years. The three mounting holes in each hinge (Fig. 24) were drilled and countersunk by the customer to accommodate the flat head screws and lock washers that fasten the hinges to the body and door.

Recently, however, the foundry began to cast the countersinks to size and punch the holes. The punching operation is done by the foundry, usually in the same fixture employed in straightening the casting. The lock washers grip the cast surface much better than the machined surface, but, more important, a major item of machining expense was eliminated.

Radiography a Design Tool — Radiography, by means of cobalt 60, has proved to be a valuable tool at Central Foundry for: 1. Checking new casting designs before they are released for production. 2. Designing gating layouts which will produce the best quality castings at the lowest possible cost. 3. Establishing standards for inspection by other methods.

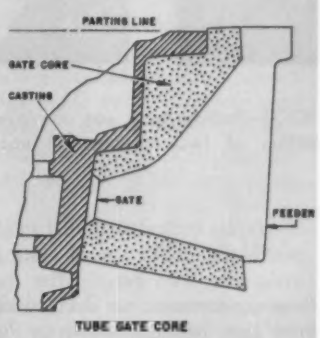
Our radiography building, a special windowless structure with 3-ft-thick concrete walls, is equipped with a 30-curie, cobalt 60 source of gamma radiation. The source, housed in a 1000-lb lead container (Fig. 25), is handled entirely by remote control.

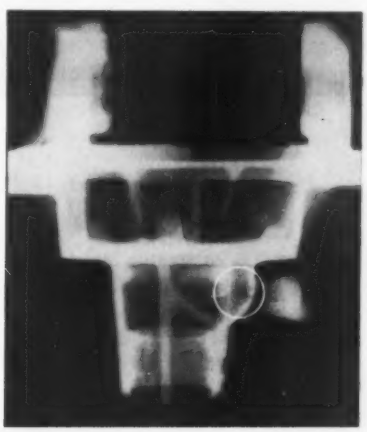
Here are some examples of how radiography assisted in improving casting soundness and production techniques.

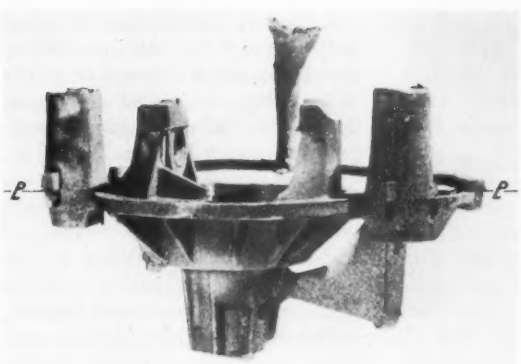
In the first example, radiography was utilized to eliminate one gate and a feeder on a differential carrier. The first sample castings (Fig. 26) were made with three gates and feeders, two on the flange and one on the tube. The gate on the tube was not formed as part of the mold, but required a separate gate core. Fig. 27 shows a cutaway view of the position of the gate core in relation to the casting. It was desirable to eliminate the tube gate, since it added cost and extra operations to the making of the casting. The radiograph of the casting made in this manner indicates a slight shrinkage (circled in Fig. 28) in the tube gate area. It is apparent that the feeder was not providing adequate feed.

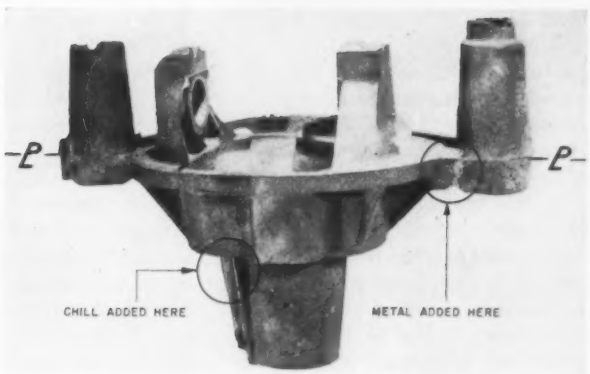
Many variations with only two flange gates were tried until satisfactory castings were made. Some redesign was necessary, however, which was accomplished by adding 5 oz of metal to a thin section near one gate, as shown in Fig. 29, and by inserting a chill in the tube area. With this chill, it was possible to equalize the cooling rate in the heavy, isolated tube section without the use of an additional feeder. After these changes were made, the production castings were radiographed and found to be sound.

Fig. 26 (left, below)—Radiography was used to eliminate one gate and a feeder on this differential carrier Fig. 27 (drawing, right)—A cutaway view of position of the gate core in relation to the casting. Fig. 28 (far right)—Radiograph shows slight shrinkage (circled). Fig. 29 (right, below)—Heavying up a thin section and using a chill solved the problem









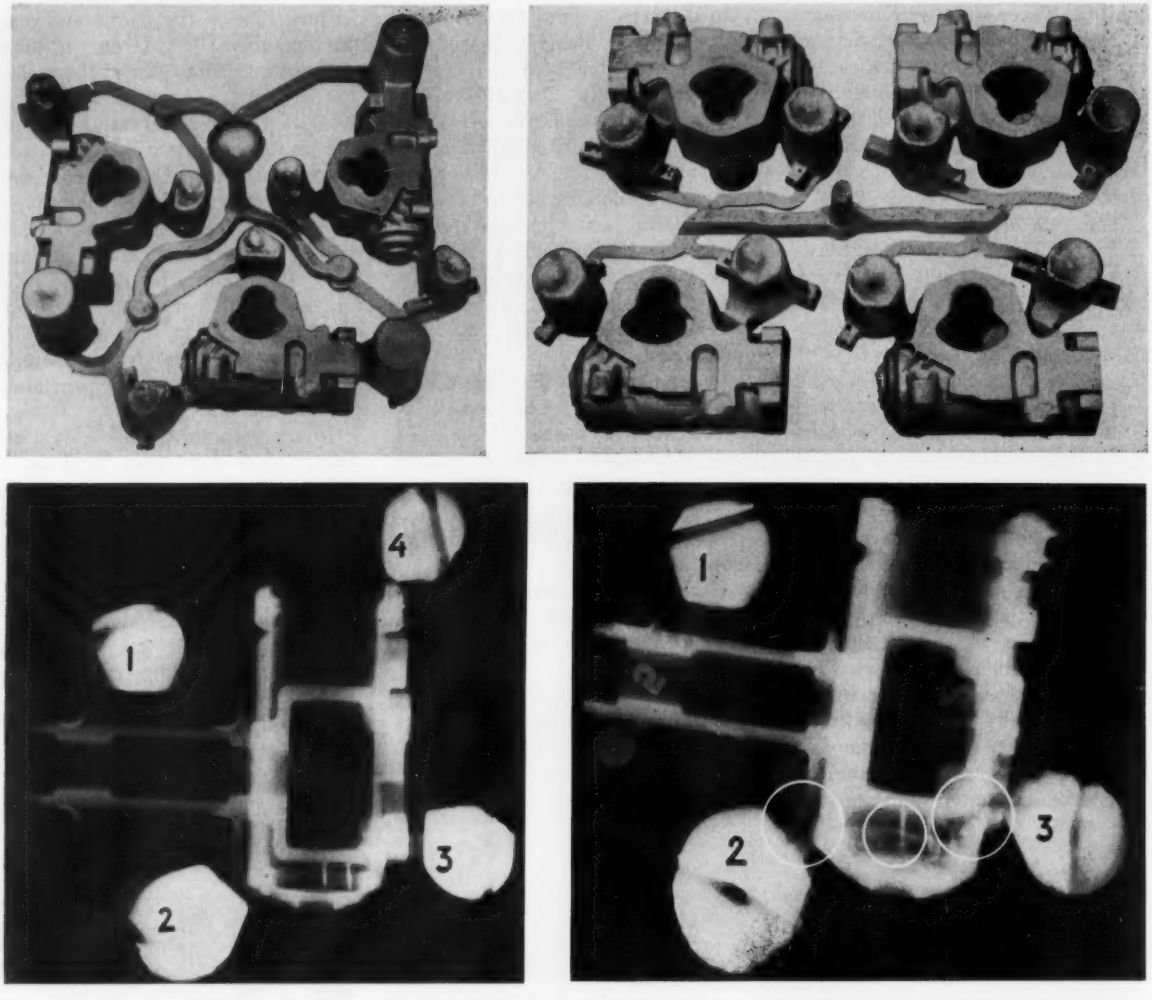


Fig. 30-33—Radiography was employed to guide design changes which helped production of two castings. In each instance, original method is on left

Production of quality castings at lower cost is accomplished only by a series of methodical steps on each job. With radiographs, the engineer can determine accurately when, and if, further design changes are necessary.

A typical example of how radiography is used to improve foundry practice is a steering gear housing. Initially, three gates and feeders plus two external chills were required to make a sound casting. Because of this heavy gating, as well as three external cores per casting, only two castings could be made in a mold.

Discussions with our customers eliminated the external cores, and the job was converted to a three-on mold shown in Fig. 30. Further improvement was desirable, and radiographs indicated that it might be possible to make sound castings by using only two gates. After numerous experiments, we decided on the two gate locations shown in Fig. 31. This improvement was made possible by a slight design change which eliminated the two external chills and added two gate pads to the casting to provide adequate feeding. With only two feeders per casting, and the change in feeder location, it was possible to make four castings per mold.

A further example of improving foundry practice through the use of radiography is another steering gear housing. This casting was gated in the same manner as many housings of this type, with four gates and feeders. The casting and its attached feeders were first radiographed and examined for porosity. (Fig. 32). Radiographs of the four feeders showed very little internal shrinkage, a sign of excess feed metal.

With this information as a guide, it was decided to reduce the height of feeders 1, 2, and 3 by $1\frac{1}{2}$ in. and through a design change eliminate feeder 4. A small amount of metal was added to the wall of the tube section to permit feeders 1, 2, and 3 to feed this section through progressive solidification.

As it turned out, these changes were too drastic, since shrinkage voids appeared in the vicinity of feeders 2 and 3 as marked in Fig. 33. Note that no shrinkage voids appeared in the vicinity of feeder 1, indicating sufficient feed metal there.

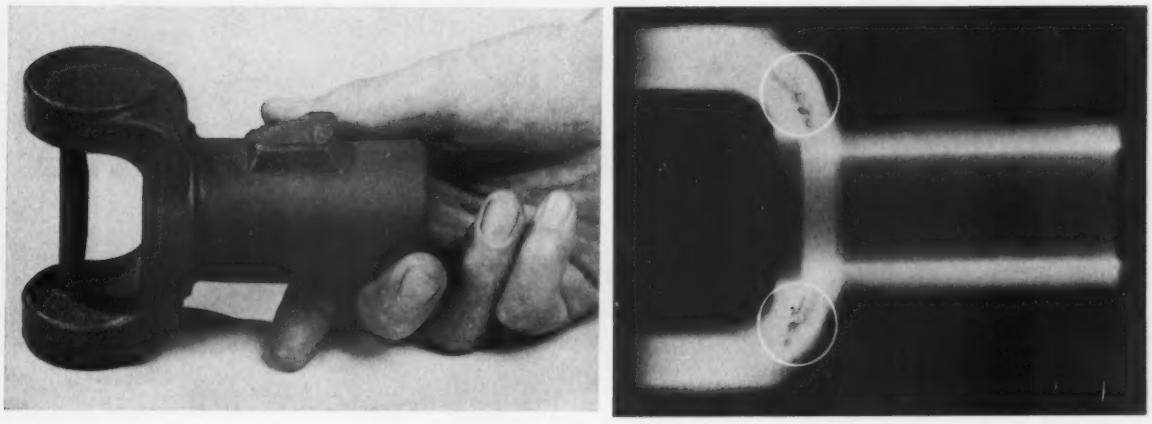


Fig. 34-35 (left and right, respectively)—Radiography showed shrinkage in this pearlitic malleable universal joint yoke when wall thickness was reduced 1/16 in.

To eliminate the shrinkage voids, the volume of metal in feeders 2 and 3 was increased by raising the feeders ½ in. This additional metal was sufficient to eliminate the shrinkage voids, and resulted in a sound casting.

The part in Fig. 34 is a universal joint yoke made in pearlitic malleable. It has a single gate and feeder on the tube of the casting. The casting user requested a reduction of 1/16 in. in wall thickness along the entire tube.

After the pattern change was completed, a sample casting (Fig. 35) was checked radiographically. It was found that shrinkage voids had developed in the yoke arms (circled in Fig. 35). The feeder was radiographed and found to have sufficient feed metal. This indicated that the decreased section thickness of the tube was causing the shrinkage voids. Therefore, the section thickness of the tube, from the gate area to the yoke arm, was increased to its original thickness to permit feeding of the shrinkage voids. By utilizing this design, we were able to produce a sound casting.

With the help of radiography, a number of problems were solved on the small gasoline engine crankshaft shown in Fig. 36. This casting originally was made with two gates and feeders. Because of the geometry of the part, this gating was considered necessary to produce a sound casting. A small tie bar was required between the two counterweights to prevent distortion during annealing. Since the gates were on a contoured surface, removal by grinding was a costly, time-consuming operation.

Because these gates had to be ground, it was impossible to hold to the exact contour of the shaft. This presented the customer with problems, because of the resulting intermittent cut on the shaft during the turning operation. The irregular gate contours also made the shafts difficult to press straighten at the foundry because of the inaccurate die contact.

The casting as shown in Fig. 37 was redesigned to combine the two gates in the form of an enlarged tie bar that could be removed with a milling operation. Experimental castings made in this manner were satisfactory, and a pattern change was made to incorporate the new layout into the production equipment. It is now possible for the customer to process these castings without the previous machining difficulties. In addition, removal of the gates from the shaft diameters allowed better contact in the straightening fixtures, and we were able to supply straighter crankshafts. These changes resulted in a cost reduction of 2.3 per cent.

In summarizing, we find that cobalt 60 provides these major benefits: A means of determining the correct safety factor in gating to insure internal soundness in castings; a guide to sound casting techniques with a minimum of pilot casting trials; and a technique for enlarging the scope of casting applications throughout industry. The potential is virtually unlimited.

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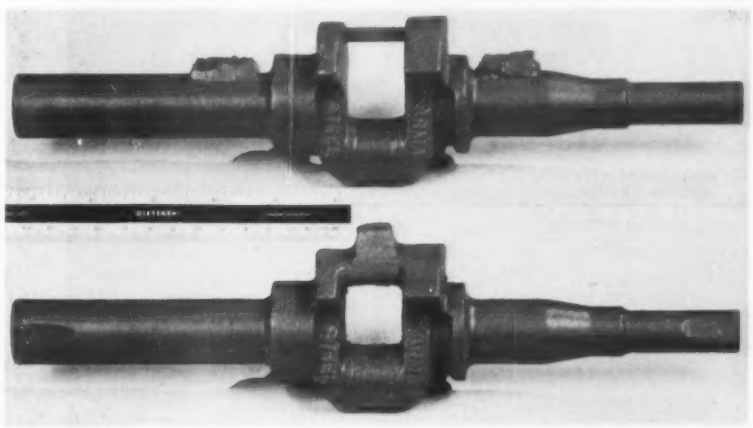
Fig. 36-37 (top and bottom, respectively)—Radiography also aided in redesign of crankshaft. Product was improved and cost was reduced 2.3 per cent



The Casting Conference . . . A Useful Marketing Tool

Designers and buyers of castings are interested in learning more about cast products. A conference or clinic on the subject is one way to disseminate this information. Here are suggestions, based on actual experiences, for arranging a conference

Simple demonstrations of various foundry processes are attention getters. Here's how the General Electric Co. explained the CO_2 process at its castings seminar

● HOW EFFECTIVE a marketing tool is the foundry-sponsored conference or clinic at which the potentials of cast products are explained to consumers?

How does a foundry go about arranging such a meeting?

For answers to these questions, FOUNDRY sought the opinions of foundries which have conducted conferences.

In general, these foundries see considerable merit in bringing casting users together for informative discussions. There is fair agreement among them as to how the sessions should be conducted and what should be discussed, although recommendations on small details vary somewhat among the different companies.

Aside from the more obvious benefits that foundries derive from these conferences, there can be an indirect benefit. As the president of one company puts it, "These meetings have as much importance to the foundry as they have to those whom we are attempting to familiarize with casting design principles. I am sure that our over-all casting quality has been greatly improved since alerting our staff to the benefits and principles involved in manufacturing a thoroughly dependable and high-quality product which will fill

Design conference is addressed by Elmer Braun, works manager, Central Foundry Div., GMC. The company was host to 1200 persons at 14 conferences last year

the designer's greatest expectations."

Why a Conference? — There's nothing new, of course, in the idea of inviting customers and prospects to your plant to acquaint them with the good points of your products and your capabilities in supplying those products. In the case of foundries, however, the value of these conferences is heightened by the fact that for many years the industry as a whole has done relatively little to publicize the merits and versatility of cast products.

This is not to imply that any manufacturers are unaware of the existence of castings. But the fact that they would like to know more about how and where they can benefit by incorporating cast components in their products, and how the design of castings can be improved, has been demonstrated repeatedly.

For instance, a study by the Gray Iron Founders' Society showed that 92 per cent of the product engineers and buyers queried said that they would appreciate help from foundries on the design or redesign of their products.

Two years ago, General Electric Co.'s Foundry Dept. decided to hold a castings seminar after a number of that company's engineers indicated in a questionnaire that they would like more information on castings. Nearly four times as many persons showed up for the session as were expected when the seminar originally was proposed.

One foundry which has conducted a series of casting conferences said, "When we started to hold these meetings we supposed that their social side would be of paramount importance to the customers. Actually, we soon found that the matter of good fellowship was of little concern to them and that they were strongly interested in discussing casting design and design principles in general."

How To Proceed—Assuming that the foundry has decided to conduct a conference, how does it proceed? Whom should it invite? What sort of program should be arranged? Where should the meeting be held?

Most foundries have held their conferences at the plant and have included an inspection of operations as part of the program. On the other hand, one foundry has conducted a series of dinner meetings in various cities where its customers' plants are situated. A few foundries without adequate meeting facilities at their plants have chosen a local hotel or club for the meeting site.

Some foundries feel that it is highly desirable for its guests to view foundry operations. Speaking recently about its successful casting design conferences, James H. Smith, general manager, Central Foundry Div., General Motors Corp., pointed out that his company had found "an appalling lack of knowledge concerning our products, processes, and capabilities, even among those people who should know us best—our own customers. In many cases, the casting buyers and users had never been in a foundry, had no idea how a casting is made and, above all, were not familiar with the capabilities of our process. Obviously, we needed a showcase for our wares—a way to let the key people in our customers' organizations know what we were doing and what we could do for them."

The Program—Arrange it so that it is fast moving and does not become tiring with long talks. Make it informative and get down to cases. Remember that the primary interest of the audience is, "What do you have to offer in a product that will do a better job at less cost than the one I am now using?"

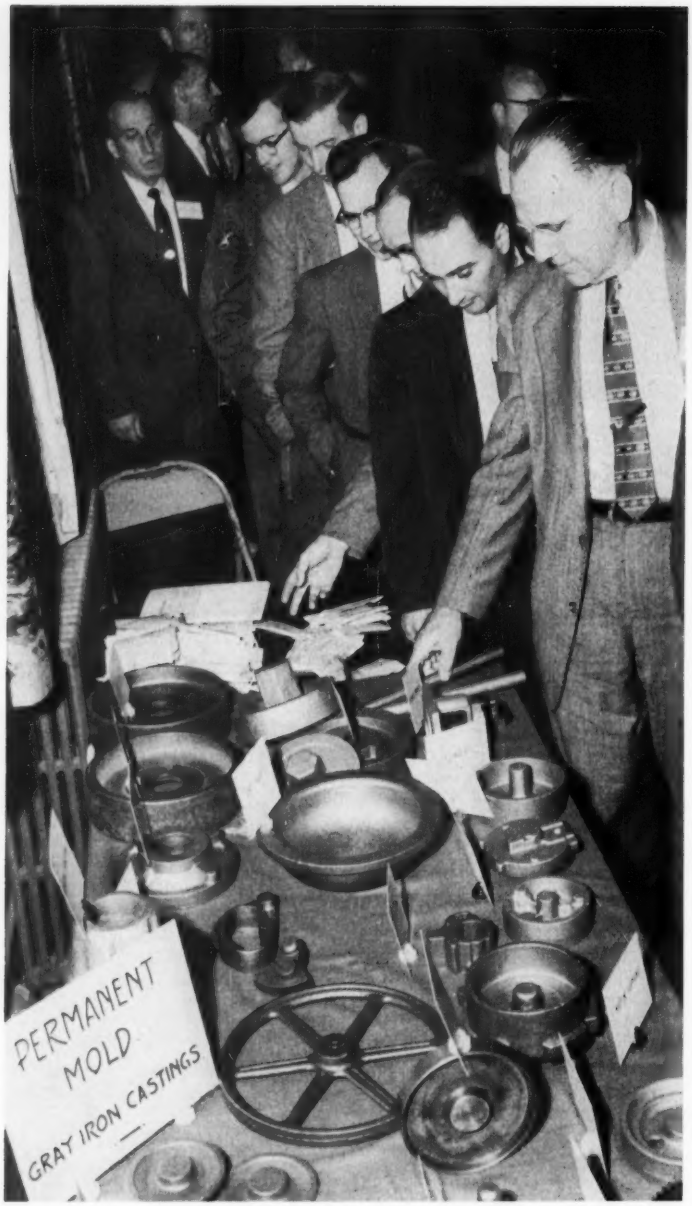
The manager of one foundry points to the danger of making the discussion subjects too elementary. "Designers of metalworking equipment who have been in the game for a number of years usually have a well grounded engineering background. Consequently, a clinic will appeal to them only if it is going to show them something that they don't know about. If we are going to hold our audience through a full day's conference, we are certainly not going to be able to be elementary in our discussion."

Be sure to allow plenty of time for the answering of questions.

A fairly comprehensive display of typical castings you have produced always attracts interest.

Don't make the conference an occasion for a sales "pitch." Sell castings, not your company. There's a natural inference that you can supply the type of product you are discussing, so there's no necessity for emphasizing in a TV-commercial-type manner how good you are.

One foundry pointed out that the program of its conference included no sales personnel among its speakers. "Our sales force attended the



Displays of typical castings made by the foundry help to illustrate the plant's capabilities. Shown here is part of a General Electric exhibit

clinics in much the same manner as our guests. We felt that the actual purpose of the clinics should be to provide mutual understanding between the users of castings and the producers, and that any semblance of trying to get our customers to our plant for a concentrated sales effort would defeat the purpose of the clinics. We avoided completely any high-pressure sales tactics."

Subjects related to design naturally rank high on a conference program. Examples of how specific parts have been redesigned so as to be less costly, stronger, or easier to use can suggest to the listener similar opportunities for some of his products.

Titles of Talks—Here are the programs presented by several foundries at their conferences. One day-long program included these topics:

What's Your Choice? What Is the Best Metal for a Specific Part? A discussion of ferrous metallurgy, including physical properties, effect of heat treatment, and use of alloys.

Plus or Minus—A practical approach to tolerances.

Cost Reduction—Fact or Fancy—Practical examples of redesign, pattern equipment, and engineering to reduce costs.

Movie—"Photo-Elastic Studies at Joint Sections in Steel Castings and Weldments."

Common Sense Casting Design.

What Help Should You Expect from a Foundry Source?

Another foundry included these talks at a morning session, followed by a plant inspection and question-and-answer period in the afternoon:

Use of Stress Analysis in Casting Design.

Tolerances, Specifications, and Pattern Equipment.

Melting Procedures, Heat Treating, and Metallurgy.

Quality Control and Production Control.

Central Foundry Div. of General Motors, which last year played host to more than 1200 persons at 14 one-day conferences, talked about these subjects:

Foundry terminology, molding methods, cost of tooling, and costing procedures.

Use of Cobalt 60 in developing proper gating and improving design and inspection procedures.

Examples of how design improvement has produced better castings at reduced costs.

Advantages and disadvantages of shell castings.

An explanation of ferrous metallurgy, applications, and machining characteristics.

A practical approach to casting tolerances.

Examples of lighter, stronger, and more economical castings developed by use of stress analysis.

The General Electric Co. seminar which the company conducted for its engineers had the following topics:

What the Foundry Can Do for the Designer.

What's New in Foundry Methods.

When To Use a Casting.

How To Get Best Results from Castings.

Vacuum Technology and New Alloys.

Industrial Creativity.

Examples of Cost Reducing Conversions.

A foundry which has held a number of evening sessions offered this program: A general interest film related to design; a talk on design principles; descriptions and examples of various stress analysis problems; a question-and-answer session. This last part of the program, incidentally, generally proved to be the most prolonged and, according to the company, the most productive

both sales-wise and educationally.

The Speakers — It's important, naturally, that the persons selected to present the various talks not only know their subjects, but also be able to get them across to their audience and be able to answer questions.

In some cases it may be desirable to bring in speakers from outside the company. One foundry, although well staffed technically, has included an independent consultant and a university professor on its conference program. It feels that such men, specialists in the subjects they discussed, lend authority to the information presented.

The Audience — Obviously you will want to invite design engineers to your conference—also buyers. Practice followed by one foundry is to tell chief engineers and directors of purchases about the proposed program and ask them to designate the personnel they feel would benefit from it; subsequently it was found that many other executives were interested in the program and were invited.

Another foundry said it felt that since it is difficult to present information of interest that is fully understood by both technical and nontechnical personnel, it chose the technical side and invited primarily engineers and designers to attend.

Several foundries have included production people, including machine shop personnel, on its invitation list.

Preferred size of the audience varies somewhat according to the facilities available. Some foundries prefer to hold the number of guests to 20 to 35. Others feel that a group of 50 to 75 can be handled satisfactorily.

One day is generally regarded as the maximum amount of time to devote to a conference.

The Follow-Up—Most foundries supply their guests with brochures of some sort. They may be merely a description of the plant facilities or also may include engineering data. One company furnishes each guest a booklet containing copies of all the talks given at the conference, including illustrations.

Foundries generally do not follow up the conference with a concerted sales effort, although salesmen naturally pursue further with the customer any problems or questions concerning specific applications which may develop during the meeting.

Not for Us—Many foundries probably feel—and rightly so—that they are not large enough to handle the sort of conference discussed here. Such companies might consider the feasibility of joining with noncompetitive foundries in their area in conducting a joint conference. Elaborate and expensive arrangements are not necessary, and outside speakers are available in the event all of the desired talent is not available within the sponsoring foundries.

Some foundrymen believe that the matter of selling designers on the more widespread use of castings is something that is best handled by the foundry industry societies. Actually, this type of promotional work already is being done in some areas. For instance, the Gray Iron Founders' Society this year is sponsoring 24 one-day clinics on the designing and processing of gray iron castings, with the audience made up of castings users. Through the Malleable Castings Council a large segment of the malleable foundry industry is conducting an extensive advertising campaign directed primarily to designers and buyers of castings.

Undoubtedly there is a need for both individual and collective effort in this important phase of marketing. And whether the foundry is large or small, it can take advantage of the potential benefits incident to giving users a better understanding of the capabilities of the casting process.

It's desirable to show visitors your plant operations, but some foundries have held successful conferences without a tour. Here visitors at Central Foundry Div. view a sonic testing machine which had been described earlier

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CHICAGO MEETING

To Attract Founders and Designers

● BOTH foundrymen and users of castings will find much of interest at Chicago from April 13 to 17. Center of attraction will be the combined Castings Congress and Engineered Castings Show sponsored by the American Foundrymen's Society.

Registration headquarters will be at the Sherman Hotel, which also will be the site of the Castings Show. Technical sessions also will be held at the Sherman, while the annual banquet and several other dinners are scheduled for the Morrison Hotel.

Technical Program — A well rounded technical program of approximately 90 papers will be presented at Chicago. About 20 of these papers will be of primary interest to designers and users of castings but will also include useful information for the foundryman. The complete technical program starts on Page 132.

Shop Courses—Five shop courses are scheduled. Two Malleable Division courses will cover machining of malleable iron and a symposium on the effect of melting variables on malleable iron properties.

Subject of the Sand Division course will be a panel discussion of air-set and CO_2 process binders.

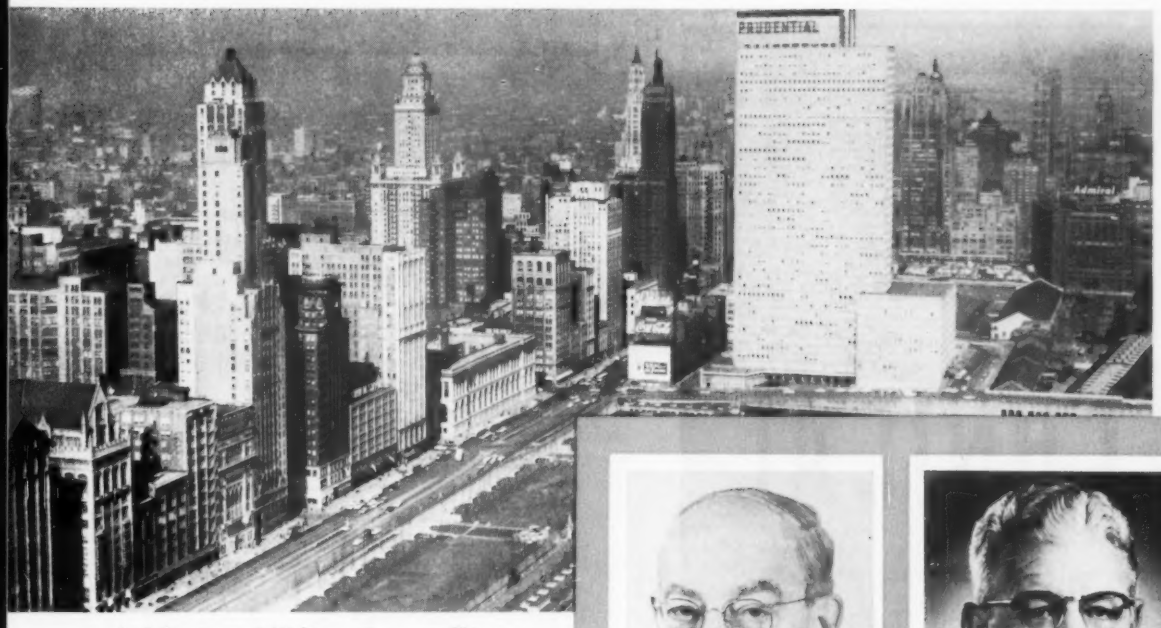
At one Gray Iron Division course a panel will discuss how to melt several irons in one heat. Subject at the second course will be the correction of cupola irregularities.

Management Subjects — Of particular interest to foundry management will be two sessions on industrial engineering and costs, plus a luncheon session sponsored by the Management Development Committee. At the latter meeting, on Wednesday, April 15, Robert B. Parker, American Brake Shoe Co., New York, will be moderator for a panel of four foundry executives who will discuss the development of various types of foundry personnel.

Plant Visitations

Arrow Pattern & Foundry Co. Inc.
Beardsley & Piper Division, Pettibone Mulliken Corp.
Blaw-Knox Co.
Burnside Steel Foundry Co.
(by appointment only)
Calumet Steel Castings Corp.
Chicago Malleable Castings Co.
(by appointment only)
Faunt Foundry Co.
Federated Metals Division, American Smelting & Refining Co.
Hammond Brass Works
Hansell-Elcock Co.
(by appointment only)
Harbison-Walker Refractories Co.
Benjamin Harris & Co.
Illinois Clay Products Co.
Illinois Institute of Technology
International Molding Machine Co.
R. Lavin & Sons Inc.
Lindberg Engineering Co.
Love Bros. Inc.
(by appointment only)
Museum of Science and Industry
Nichol-Straight Foundry Co.
Pettibone Mulliken Corp.
Pickands, Mather & Co.
Steel City Testing & Engineering Laboratories
University of Illinois, Navy Pier
Western Electric Co.

For full details regarding plant visitations, refer to the official printed program and the plant vistation desk at the show.



At left, view of Michigan Avenue, Chicago

HARRY M. ST. JOHN
Hoyt Lecturer

WARREN WHITNEY
Banquet Speaker

Business Meeting — The annual AFS business meeting, to be held Wednesday morning, will be presided over by national president Lewis H. Durdin, president, Dixie Bronze Co., Birmingham. Election of officers, awarding of prizes in the Robert E. Kennedy Memorial Apprentice Contest, and the presentation of Awards of Scientific Merit and Service Citations will be on the program.

Officer and director nominees to be voted on at the meeting include the following: President, Charles E. Nelson, technical director, Magnesium Div., Dow Chemical Co., Midland, Mich.; vice president, Norman J. Dunbeck, vice president, Industrial Minerals Div., International Minerals & Chemical Corp., Skokie, Ill.

Directors for three years: Norman N. Amrhein, president, Federal Malleable Co., West Allis, Wis.; Cecil N. King, plant manager, Chrysler Foundry, Detroit Chrysler Corp., Detroit; Robert E. Mittlestead, metallurgist, Lectromelt Casting Div., Akron Standard Mold Co., Barberton, Ohio; A. J. Moore, executive vice president, Canadian Bronze Ltd., Montreal; William H. Oliver, general manager, Bond Plant, American Radiator & Standard Sanitary Corp., Buffalo; James N. Wessel, metallurgist, Puget Sound Naval Shipyard, Bremerton, Wash.

Hoyt Lecture—"The Control of Quality in the Brass Foundry" is the subject of this year's Charles Edgar Hoyt Memorial Lecture. It will be delivered immediately following the business meeting by Harry M. St. John, foundry consultant. Mr. St. John, retired superintendent of nonferrous foundries, Crane Co., Chicago, is the author of *Brass and Bronze Foundry Practice* and well known in the nonferrous castings industry.

Annual Banquet—Presentation of AFS Gold Medal Awards will take place at the annual banquet on Wednesday evening at the Morrison Hotel. Principal speaker at the banquet will be Warren Whitney, vice president of James B. Clow & Sons and general manager of its National Works, Birmingham. Mr. Whitney is widely quoted on many phases of business management, industrial relations, public relations, and sales. His ability to mix humor and a serious message has caused him to be in constant demand as a speaker.

Ladies Entertainment—A committee appointed by the AFS Chicago Chapter under the chairmanship of Mrs. John Mulholland has arranged a varied program of entertainment for ladies attending the convention.

Opening event will be a registration tea at the Bismark Hotel on Monday afternoon, with Mrs. W. W. Moore as chairman. On Tuesday a bus trip to Skokie, Ill., with luncheon and style show at Marshall Field & Co. there, is scheduled. Mrs. J. T. Moore is chairman. A tour of the Merchandise Mart under the chairmanship of Mrs. John H. Owen has been arranged for Wednesday. Concluding event will be a tea and musicale at the Sheraton Hotel on Thursday, with Mrs. Roy W. Schroeder as chairman.

AFS TECHNICAL PROGRAM

MONDAY, APRIL 13

8 a.m.—Registration opens (to 5:30 p.m.).

9 a.m.—Ladies' registration opens (to 3 p.m.).

9 a.m.—Exhibits open.

9:30 a.m.—Light Metals Session

Effect of Starch Content on a Rammed Graphitic Mold Material for Casting Titanium—H. W. Antes, R. E. Edelman, Frankford Arsenal, Philadelphia.

Some Principles for Producing Sound Al-7 Magnesium Alloy Castings—W. H. Johnson, J. G. Kura, Battelle Memorial Institute, Columbus, Ohio.

9:30 a.m.—Malleable Session

Malleable Iron—A Magnetic Alloy—W. K. Bock, National Malleable & Steel Castings Co., Cleveland.

Chemical Analysis vs. Heat Treatment Effects on Tensile Strength of Malleable Iron—Controlled Annealing Committee (6-D) Report—L. R. Jenkins, Wagner Castings Co., Decatur, Ill.

Casting Heavy-Section Malleable Iron—Research Progress Report—R. W. Heine, University of Wisconsin, Madison.

9:30 a.m.—Pattern Session

Coreboxes for Shell Cores—J. E. Stock, John Deere Waterloo Tractor Works, Waterloo, Iowa.

Motion picture—*Plastic Tooling & Patternmaking with Epoxy Resins.*

12 noon—Light Metals Roundtable Luncheon

What Does the Test Bar Mean to the Producer and User of Castings? Panel—R. L. Heath, Rocketdyne Div., North American Aviation Inc., Canoga Park, Calif.; H. Rosenthal, Frankford Arsenal, Philadelphia; M. E. Brooks, Dow Chemical Co., Bay City, Mich.

12 noon—Malleable Roundtable Luncheon

Selection of Materials for Ordnance Development Programs—V. Lindner, Feltman Research & Engineering Laboratories, Picatinny Arsenal, Dover, N. J.

Motion picture—*Toward More Effective Shell.*

2 p.m.—Brass and Bronze Session

Electrical Conductivity of Sand Cast Copper-Base Alloys—D. G. Schmidt, F. L. Riddell, H. Kramer & Co., Chicago.

Some Foundry Problems in the Development of a New Marine Propeller Alloy—A. J. Smith, Bethlehem Steel Co., Shipbuilding Div., Staten Island, N. Y.

2 p.m.—Pattern Session

New Horizons in Pattern Engineering Materials—J. E. Olson, Dike-O-Seal Inc., Chicago.

Construction of and Materials for CO_2 Pattern and Corebox Equipment—R. J. Carver, Carver Foundry Products Co., Muscatine, Iowa.

2 p.m.—Sand Session

Experimental Determination of Specific Surface and Grain Shape of Foundry Sands—Franz Hofmann, George Fischer Ltd., Schaffhausen, Switzerland—presented by Victor Rowell, Harry W. Dietert Co., Detroit.

Critical Sodium Silicate—Sand Formulations for Optimum CO_2 Molding—R. J. Cowles, Walworth Co., Braintree, Mass.

New Foundry Resins and Application Techniques for Shell Molds and Shell Cores—W. C. Capehart, Monsanto Chemical Co., Springfield, Mass.

4 p.m.—Brass and Bronze Seminar

Subject—*Metallurgical and Foundry Aspects of Quality Control.*

Nondestructive Testing—S. Goldspiel, New York Naval Shipyard, Brooklyn, N. Y. *Mechanical Aspects of Testing*—A. J. Smith, Bethlehem Steel Co., Shipbuilding Div., Staten Island, N. Y. *Fracture Testing in a Production Foundry*—C. W. Ward, American Radiator & Standard Sanitary Corp., Cincinnati.

4 p.m.—Light Metals Session

Correlation of Radiography, Microstructure and Mechanical Properties of Magnesium-Thorium-Zirconium Alloy HK31A—T. R. Bergstrom, R. G. Bassett, Boeing Airplane Co., Seattle.

Magnesium Casting Alloy EK31XA—K. E. Nelson, Dow Chemical Co., Midland, Mich.

4 p.m.—Malleable Shop Course

Subject—*Machining of Standard and Pearlitic Malleable Iron.*

Technical Aspects of Machinability Testing—L. C. Marshall, Link-Belt Research Laboratory, Indianapolis.

Available Machinability Data—W. C. Truckenmiller, Albion Malleable Iron Co., Albion, Mich.

Solving Machining Problems—George Kramer, Central Foundry Div., GMC, Saginaw, Mich.

5:30 p.m.—Exhibits close.

8 p.m.—Sand Shop Course

Subject—*Air-set and CO_2 Binders.* Panel: CO_2—C. W. Sundberg, Minneapolis Electric Steel Castings, Minneapolis; F. P. Ilenda, Diamond Alkali Co., Painesville, Ohio. Air-set—R. M. Ovestrud, Reichhold Chemicals Inc., Eastern Resin Div., Elizabeth, N. J.

TUESDAY, APRIL 14

8:30 a.m.—Registration opens (to 5:30 p.m.).

9 a.m.—Ladies registration opens (to 5:30 p.m.).

9:30 a.m.—Exhibits open.

9:30 a.m.—Brass and Bronze Session

Effects of Foundry Variables upon Porosity of 85-5-5-5 Bronze—Research Progress Report—R. A. Flinn and C. R. Mielke, University of Michigan, Ann Arbor.

Getting Castings Back into the Foundry—R. R. Ashley, American Radiator & Standard Sanitary Corp., Cincinnati.

Research and Development on Design of Bronze Sleeve Bearings—G. E. Langford, Superior Kendrick Inc., Detroit.

Properties and Composition of Cast Copper-Nickel Alloys—S. Goldspiel, New York Naval Shipyard, Brooklyn, N. Y.

Research on 90-10 Cupro-Nickel Castings—E. F. Tibbetts, Wollaston Brass & Aluminum Foundry Inc., North Quincy, Mass.

9:30 a.m.—Malleable Session

Specialized Foundry Statistical Controls Improve Customer Satisfaction—B. M. Appleman, Texas Foundries Inc., Lufkin, Tex.

Proper Gating through Use of Cobalt 60—A. J. Karam, Central Foundry Div., GMC, Saginaw, Mich.

Proper Interpretation and Techniques Using Magnaglo for Casting Inspection—A. R. Lindgren, Magnaflux Corp., Chicago.

9:30 a.m.—Pattern Session

Rigging Coreboxes for High-Production Core Practice—W. H. Miller, Ford Motor Co., Cleveland Foundry Div., Berea, Ohio.

Consulting Service on Pattern and Corebox Equipment Problems. Panel—M. K. Young, U. S. Gypsum Co., Chicago; R. L. Olson, Dike-O-Seal Inc., Chicago; J. F. Roth, Cleveland Standard Pattern Works, Cleveland; R. LeMaster, R. A. Nelson Pattern Co., Milwaukee; W. E. Mason, Westinghouse Air Brake Co., Wilmerding, Pa.

9:30 a.m.—Safety, Hygiene & Air Pollution Session

Practical Planning for Nondestructive Testing by Use of Radiation—F. S. Sutherland, Continental Foundry & Machine Div., Blaw-Knox Co., East Chicago, Ind.

Audiometric Testing Programs in Foundry Noise Control—H. T. Walworth, Lumbermen's Mutual Casualty Co., Chicago.

12 noon—Brass and Bronze Roundtable Luncheon

Physical and Mechanical Properties of Cast Bronze Alloys—John Kura, Battelle Memorial Institute, Columbus, Ohio.

Where General Motors Corp. Would Like to Use Copper-Base Alloy Castings—D. J. Henry, General Motors Corp., Detroit.

Cast Copper-Base Alloys for Corrosive Environments—C. L. Bulow, Bridgeport Brass Co., Bridgeport, Conn.

12 noon—Pattern Roundtable Luncheon

Atomic Blast—A Pattern for Survival—F. B. Porzel, Armour Research Foundation, Chicago.

2 p.m.—Education Session

New Skills Required for the Shell Process—H. C. Grant, Ford Motor Co., Dearborn, Mich.

2 p.m.—Industrial Engineering and Cost Session

The Industrial Engineer—A Potential Foundry Executive—M. E. Mundel, consultant, Milwaukee.

Practical Industrial Engineering for the Smaller Foundry—F. E. Noggle, Westover Corp., Milwaukee.

2 p.m.—Light Metals Session

Hot Cracking Test for Light Metal Casting Alloys—E. J. Gamber, Aluminum Co. of America, Cleveland.

Sample for Rapid Measurement of Gas in Aluminum—H. V. Sulinski and S. Lipson, Frankford Arsenal, Philadelphia.

Ultrasonic Attenuation in Cast Aluminum—H. Smolen and H. Rosenthal, Frankford Arsenal, Philadelphia.

2 p.m.—Malleable Session

Effect of Bonding Clays on Pin Holes in Malleable Castings—D. R. Jones, Illinois Clay Products Co., Chicago, and R. E. Grim, University of Illinois, Urbana.

Porosity-Inclusion-Pinholes in Malleable Castings—C. A. Sanders, American Colloid Co., Skokie, Ill.

4 p.m.—Gray Iron Shop Course
How to Melt Several Irons in One Heat. Panel—R. L. Johnson, Bucyrus-Erie Co., Erie, Pa.; M. D. Neptune, James B. Clow & Sons Inc., Birmingham; K. G. Presser, Buckeye Foundry Co., Cincinnati.

4 p.m.—Malleable Shop Course
Effect of Melting Variables on the Properties of Malleable Irons—R. W. Heine, University of Wisconsin, Madison. Panel discussion—W. D. McMillan, International Harvester Co., Chicago; Milton Tilley, National Malleable & Steel Castings Co., Cleveland; Eric Welander, John Deere Malleable Works, East Moline, Ill.

4 p.m.—Light Metals Session
How Aircraft Designers Look at Light Metal Castings—A. R. Mead, Grumman Aircraft Corp., Bethpage, L. I., N. Y.
A Preliminary Appraisal of Bending Techniques for Evaluation of Cast Metals and Structures—J. C. Graddy, Douglas Aircraft Co., Santa Monica, Calif.
Design Engineering as Related to Magnesium Castings—G. H. Found, Arthur D. Little Inc., Cambridge, Mass.

4 p.m.—Sand Session
How To Avoid Sand Segregation—W. D. Chadwick, Manley Sand Co., Rockton, Ill. Motion picture—*Segregation of Sand During Handling.*

4 p.m.—Steel Session
Interrelation Between Stress Concentration and Castability—J. B. Caine, consultant, Cincinnati.
Aid for the Design Engineer—Accentuate the Positive—J. J. Henry, Missouri Steel Castings Co., Joplin, Mo.
A Method of Obtaining Both Castability and Maximum Field Service from Cast Products—J. W. Beckhan, Texas Foundries Inc., Lufkin, Tex.

5:30 p.m.—Exhibits Close

6:30 p.m.—Sand Dinner
Let's Start Over—J. B. Caine, Cincinnati.

7 p.m.—Canadian Dinner

WEDNESDAY, APRIL 15

8:30 a.m.—Registration opens (to 5:30 p.m.).

9 a.m.—Ladies registration opens (to 3:00 p.m.)

9:30 a.m.—AFS Annual Business Meeting
President's annual address. Election of officers and directors. Apprentice contest awards. Presentation of AFS Awards of Scientific Merit and Service Citations.

10:30 a.m.—Charles Edgar Hoyt Memorial Lecture
The Control of Quality in the Brass Foundry.—Harry M. St. John, consultant, and retired superintendent, Crane Co., Chicago.

11:30 a.m.—Exhibits open.

12 noon—Management Luncheon and Session
Developing Technical Personnel—J. H. Culling, Carondelet Foundry Co., St. Louis.
Developing Operating Supervisory Personnel—L. J. Woehlke, Grede Foundries Inc., Milwaukee.
Developing Sales Personnel—H. A. Forsberg, Blaw-Knox Co., East Chicago, Ind.
Developing Administrative Management — F. J. Dost, Sterling Foundry Co., Wellington, Ohio.

12 noon—Diecasting and Permanent Mold Luncheon
Vacuum Die Casting—G. R. Morton, Morton Mfg. Co., Omaha, Nebr.

2 p.m.—Gray Iron Session
Continuous Carbon Injection—J. E. Wilson and R. C. Shnay, Canada Iron Foundries Ltd., Montreal, Que.
Quantitative Measurement of the Effects of Pearlite and Graphite on the Machinability of Cast Iron—W. W. Moore, Battelle Memorial Institute, Columbus, Ohio, and J. O. Lord, Ohio State University, Columbus.
Significance of Reported Chemical Analysis of Cast Iron—D. E. Krause, Gray Iron Research Institute, Columbus, Ohio.

2 p.m.—Diecasting and Permanent Mold Sesssion
Some Practical Aspects of Diecasting Aluminum—G. H. Found, Arthur D. Little, Inc., Cambridge, Mass., and John Lapin, Central Foundry Div., GMC, Saginaw, Mich.
Thermal Aspects of Cyclic Permanent Mold Operation—C. L. Goodwin, and H. Y. Hunsicker, Aluminum Co. of America, Cleveland.
Permanent Molding of Gray Iron—H. U. McClelland, Eaton Mfg. Co., Vassar, Mich.

2 p.m.—Steel Session
Properties of Some Cast and Wrought Alloy Steels for Use at Elevated Temperatures—R. K. Buhr and W. A. Morgan, Dept. of Mines & Technical Surveys, Ottawa, Ont.
Significance of Reduced Phosphorus and Sulfur Content—J. Zotos, Watertown Arsenal, Rodman

Laboratory, Watertown, Mass.
Foundry Characteristics of Mn-Va-Mo Age-Hardening Steel—N. C. Howells and E. A. Lange, U. S. Naval Research Laboratory, Washington.

4 p.m.—Diecasting and Permanent Mold Session
Evaluation of Cast Surfaces for Roughness Standards—Eldon Swing, Boeing Airplane Co., Wichita, Kans.
A Hypereutectic Aluminum-Silicon Alloy—R. Kissling and O. Tichy, Apex Smelting Co., Cleveland.
X364 *Aluminum Diecasting Alloy*—J. H. Moorman and E. V. Blackmun, Aluminum Co. of America, Pittsburgh.

4 p.m.—Gray Iron Shop Course
Correction of Cupola Irregularities—W. W. Levi, Lynchburg Foundry Co., Radford, Va.; M. H. Horton, Deere & Co., Moline, Ill.; D. E. Krause, Gray Iron Research Institute, Columbus, Ohio.

4 p.m.—Industrial Engineering and Cost Session
Profit Management through Cost Control—Robert Hill, Dominion Bridge Co., Montreal, Que.
Timestudy and Methods Training for Supervisors—John Taylor, Norris & Elliott Inc., Columbus, Ohio.

4 p.m.—Sand Session
Green Tensile and Shear Strength of Molding Sands—R. W. Heine, University of Wisconsin, Madison, and E. H. King and J. S. Schumacher, Hill & Griffith Co., Cincinnati.
Core Stickiness Committee (8-K) Report—J. R. Young, Cadillac Motor Car Div., GMC, Detroit.
Shell Mold and Core Committee (8-N) Report—R. J. Cowles, Walworth Co., Braintree, Mass.

5:30 p.m.—Exhibits close.

7 p.m.—AFS Annual Banquet (Morrison Hotel)
Presentation of AFS Gold Medal Awards
Guest speaker—Warren Whitney, vice president and general manager, National Works, James B. Clow & Sons, Birmingham.

THURSDAY, APRIL 16

8:30 a.m.—Registration opens (to 5:30 p.m.).

9 a.m.—Ladies registration opens (to 12 noon).

9 a.m.—Exhibits open.

9:30 a.m.—Ductile Iron Session
Tensile Properties of As-Cast and Annealed Ductile Iron—A. H. Rauch, J. B. Peck, and E. M. McCullough, Deere & Co., Moline, Ill.
Ductile Iron Castings vs. Carbon Steel Forgings and Weldments—J. B. Salbaing, International Nickel Co., New York.

9:30 a.m.—Fundamental Papers Session
Considerations of the Mechanisms of Solidification of Gray Iron—A. deSy, University of Ghent, Ghent, Belgium.
Grain Refinement of Solidifying Metals—R. G. Garlick and J. F. Wallace, Case Institute of Technology, Cleveland.
A Rationalization of Effect of Mass on the Tensile Properties of Castings—P. J. Ahearn, Watertown Arsenal, Watertown, Mass., and G. W. Form and J. F. Wallace, Case Institute of Technology, Cleveland.

9:30 a.m.—Steel Session
Designing for Press-Forged Castings—P. R. Gouwens, Armour Research Foundation, Chicago.
Reclamation and Dimensional Accuracy of Sodium-Silicate-Bonded Sand—G. C. Warneke, National Malleable & Steel Castings Co., Melrose Park, Ill.

12 noon—Ductile and Gray Iron Roundtable Luncheon
What Does the Casting Designer and Buyer Expect of the Foundryman—T. O. Kuivinen, Cooper-Bessemer Corp., Mt. Vernon, Ohio.

12 noon—Steel Rountable Luncheon
Vacuum Arc Melting—S. J. Noesen, General Electric Co., Schenectady, N. Y.

2 p.m.—Ductile Iron Session
Basic Cupola Method of Melting—J. T. Williams, Grede Foundries Inc., Reedsburg, Wis.
Acid Cupola Method of Melting—H. E. Henderson, Lynchburg Foundry Co., Lynchburg, Va.
Acid Electric Furnace Method of Melting—Louis Miller, Westinghouse Air Brake Co., Wilmerding, Pa.
Production of Ductile Iron in the Basic Direct-Arc Furnace—C. R. Isleib, International Nickel Co., New York.

2 p.m.—Fundamental Papers Session
Application of Theory in Understanding Fluidity of Metals—J. E. Niesse, M. C. Flemings, and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass.
Fluidity Test for Aluminum Alloys; Tripling Fluidity with a New Mold Coating—M. C. Flem-

ings, H. F. Conrad, and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass.

Linear Programming Applied to a Foundry Cast Problem—G. I. Gartner, Watertown Arsenal, Watertown, Mass.

Dimensioning of Sand Casting Risers—H. D. Merchant, Case Institute of Technology, Cleveland.

2 p.m.—Heat Transfer Session

Design of Castings. Panel—D. J. Albanese, National Malleable & Steel Castings Co., Cleveland; A. Bain, Canada Iron Foundries, Ltd., Trois Rivieres, Que.; J. L. Flitz, Central Foundry Div., GMC, Saginaw, Mich.; E. S. Frens, General Electric Co., Schenectady, N. Y.; R. D. Veneklasen, Niforge Corp., Boston; J. F. Wallace, Case Institute of Technology, Cleveland.

2 p.m.—Sand Session

Tempering of Molding Sand—H. W. Dietert, Victor Rowell and A. L. Graham, Harry W. Dietert Co., Detroit.

The Crust Separation Test for the Investigation of Sand Expansion Defects—P. W. Goad, Institute of British Foundrymen, Australian Branch, Melbourne, Australia—presented by L. E. Taylor, Ottawa Silica Co., Ottawa, Ill.

4 p.m.—Gray Iron Session

Foundries Can Produce Their Own Cast Iron Directly—H. W. Lownie Jr. and A. J. Stone, Battelle Memorial Institute, Columbus, Ohio.

Utilization of Radioisotopes in the Foundry Industry—M. Pobereskin and D. N. Sunderman, Battelle Memorial Institute, Columbus, Ohio.

Report of Joint AWS—AFS Committee on Welding Iron Castings—Gray Iron—S. Low, Chapman Valve Mfg. Co., Indian Orchard, Mass. Ductile Iron — W. W. Edens, Allis-Chalmers Mfg. Co., Milwaukee. Malleable Iron—S. T. Walter, Air Reduction Sales Co., New York.

4 p.m.—Steel Session

Requirements for Quality Steel Castings—Y. J. Elizondo, Chance-Vought Aircraft Co., Huntington Park, Calif.

Design and Welding of Castings for Steam Turbine Applications—L. W. Songer, General Electric Co., Schenectady, N. Y.

Foundry Designing for Steel Castings—A. B. Steck, Metallurgical Associates Inc., Melrose, Mass.

Rapid Hydrogen Determination for Steel Foundry Control—C. C. Carson and B. J. Alperin, General Electric Co., Schenectady, N. Y.

5:30 p.m.—Exhibits close.

6 p.m.—AFS Alumni Dinner (Morrison Hotel).

FRIDAY, APRIL 17

8:30 a.m.—Registration opens.

9 a.m.—Exhibits open.

9:30 a.m.—Ductile Iron Session

Heat Treatment of Ductile Iron—W. D. McMillan, International Harvester Co., Chicago.

Carbon Flotation in Ductile Iron—A. H. Rauch, J. B. Peck, and E. M. McCullough, Deere & Co., Moline, Ill.

Effect of Tin on the Structure of Flake and Ductile Irons—E. C. Ellwood, Tin Research Institute, London, England—presented by J. A. Davis, Battelle Memorial Institute, Columbus, Ohio.

9:30 a.m.—Fundamental Papers Session

Development of Low-Alloy Steel Compositions for High-Strength Steel Castings—H. R. Larson and F. B. Herlihy, American Brake Shoe Co., Mahwah, N. J.

A Study of Soundness and Mechanical Properties in Plates of High-Strength Cast Steels—H. R. Larson, H. W. Lloyd and F. B. Herlihy, American Brake Shoe Co., Mahwah, N. J.

High-Strength Steel Castings—K. D. Holmes, J. Zotos and P. J. Ahearn, Watertown Arsenal, Watertown, Mass.

Structural Variables Influencing Mechanical Properties of High-Strength Cast Steels; A Progress Report—M. C. Flemings, R. Green, and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass.

9:30 a.m.—Gray Iron Session

Factors Influencing the Soundness of Gray Iron Castings—I. C. H. Hughes, K. E. L. Nicholas, A. G. Fuller, and T. J. Szajda, British Cast Iron Research Institute, Birmingham, England. Presented by I. C. H. Hughes.

Effect of Mold Materials on the Cooling Rate and Physical Properties of Cast Metals, Report of Sub-Committee T. S. 46, Institute of British Foundrymen, presented by John Hird, chairman, Birmingham, England, assisted by R. W. Ruddle, Foundry Services Inc., Columbus, Ohio.

Main Features Concerning Copper in Cast Iron—Albert deSy, University of Ghent, Ghent, Belgium.

9:30 a.m.—Heat Transfer Session

Modern Quenching Oils and Techniques for Foundry Heat Treatment—N. F. Squire, Aldridge Industrial Oils Inc., Cleveland.

Solidification Times of Simple Shaped Castings in Sand Molds—J. T. Berry, Armour Research Foundation, Chicago; G. Martin, Industrial Research Laboratories, Honolulu Oil Corp., Los Angeles, and V. Kondic, University of Birmingham, England.

9:30 a.m.—Sand Session

Timing of Expansion Scab Formation—J. E. Haller, James B. Clow & Sons, Coshocton, Ohio.

Sand Movement and Compaction in Green Sand Molding—T. J. Bosworth and R. W. Heine, University of Wisconsin, Madison; J. J. Parker, SPO Inc., Cleveland; and E. H. King and J. S. Schumacher, Hill and Griffith Co., Cincinnati.

2 p.m.—Gray Iron Session

Martensitic White Irons for Abrasion Resistant Castings—T. E. Norman, Denver; D. V. Doane and A. Solomon, Climax Molybdenum Co., Detroit.

Effect of Molybdenum on Elevated Temperature Properties of Gray Iron—G. K. Turnbull and J. F. Wallace, Case Institute of Technology, Cleveland.

Ductility and Strength of High-Carbon Gray Irons—E. M. Stein and H. L. McIntyre, Battelle Memorial Institute, Columbus, Ohio.

3:30 p.m.—Exhibits close.

AFS ANNUAL AWARDS

Gold Medal, Scientific Merit, and Service Citation awards will be made during the AFS Congress to nine men prominent in the foundry industry. Three will be honored in each award group. Medals will be presented at the annual banquet, on April 15, other awards at the annual business meeting, on the same day

GOLD MEDALS

HAROLD W. LOWNIE JR. has been chosen to receive the John H. Whiting Gold Medal "for outstanding contributions to the Society and to metallurgical progress, especially in the field of gray cast iron." Mr. Lownie, chief of the Process Metallurgy Div., Battelle Memorial Institute, Columbus, Ohio, joined the institute in 1945 following six years as foundry and materials engineer with Westinghouse Electric Corp., Pittsburgh. His research activities have included studies on properties, applications, and production of gray iron, malleable iron, and steel castings, and he has reported his findings in more than 25 articles dealing with metallurgical processing. Graduated from Purdue University, he received a master's degree from the University of Pittsburgh. He is chairman of the AFS Gray Iron Division, and also holds memberships in ASM, AIME, and the Instrument Society of America.

JOHN A. RASSENFOSS has been designated recipient of the Peter L. Simpson Gold Medal "for exceptional contributions to the Society and the steel castings industry by elevating technical endeavor in steel foundry research." Mr. Rassenfoss has been manager of the Manufacturing Research Laboratory, American Steel Foundries, East Chicago, Ind., since 1955. He was graduated from the University of Kentucky with a degree in metallurgy and in 1941 was awarded a master of science degree. Following completion of these studies, Mr. Rassenfoss joined American Steel Foundries laboratory where he has been active in development work pertaining to foundry practice. He received the Steel Foundry Facts award from the Steel Founders' Society of America in 1953. Mr. Rassenfoss has served on several AFS technical committees and was chairman of the Chicago Chapter in 1953-54.

FRED J. WALLS will be honored as John A. Penton Gold Medalist "for outstanding contributions to the Society and the castings industry, especially in the field of gray iron metallurgy and foundry practice, and for life-time devotion to the industry's potentialities." Mr. Walls, who retired recently as manager of the Technical Section in Detroit for International Nickel Co., New York, is vice president in charge of research and development for Engineering Castings Inc., Marshall, Mich. He received his technical training in metallurgy at the University of Michigan. Prior to joining International Nickel in 1934, Mr. Walls was employed in turn by Packard Motor Car Co., Detroit, Wilson Foundry & Machine Co., Pontiac, Mich., and Eaton-Erb Foundry Co., Vassar, Mich., now the Foundry Div., Eaton Mfg. Co. Mr. Walls was national president of the AFS in 1945-46 and in 1955 presented the Charles Edgar Hoyt Memorial Lecture.

SCIENTIFIC MERIT

ROBERT H. MOONEY is being honored "for technological contributions to production and working conditions in the malleable iron industry." Mr. Mooney is an electrical engineering graduate of the University of Michigan and has been with General Motors Corp. since 1929. As plant engineer for its Central Foundry Division, he was in charge of engineering and construction of the Defiance, Ohio, foundry. In 1949 he returned to Saginaw as a member of the Central office staff and was named works engineer for the division in 1953. Since 1956 Mr. Mooney has been engaged in the design, layout, and recommendations for purchase of process and plant equipment for the gray iron and malleable iron foundry built by General Motors in San Jose dos Campos, Brazil.

HOWARD H. WILDER is being honored "for noteworthy contributions to the society and its membership in furthering the technology of ferrous castings and their acceptance." Mr. Wilder received his technical training at the General Motors Institute, Flint, Mich., and began his foundry career with the Chevrolet Saginaw Gray Iron Div., General Motors Corp., Saginaw, Mich. Later he was metallurgist for Detroit Stoker Co., Monroe, Mich. During World War II Mr. Wilder served with the War Production Board at Washington. In 1946 he joined Eaton Mfg. Co., Vassar, Mich., as chief metallurgist. Since 1950 he has been with Vanadium Corp. of America, first as manager of the Iron Foundry Div. in Detroit and since 1956 as manager, engineering sales, with headquarters in Chicago. Mr. Wilder has been chairman of the Saginaw Valley Chapter of AFS and secretary of the Detroit Chapter.

ELMER C. ZIRZOW will be honored "for long and conscientious effort on behalf of the society's Sand Division in the development and application of sand technology." Mr. Zirzow's career in the foundry industry has been concerned primarily with sand. At one time coreroom foreman with National Malleable & Steel Castings Co., Cleveland, in 1948 he was appointed sand technologist in the testing and research laboratories of Deere & Co., Moline, Ill. There he engaged in research on sand problems for the company's gray iron and malleable iron foundries. Since 1951 he has been director of foundry service, Werner G. Smith Inc., Cleveland. Long active on committees of the Sand Division, Mr. Zirzow is currently chairman of that division.

ROBERT H. MOONEY

HOWARD H. WILDER

ELMER C. ZIRZOW

SERVICE CITATION

JAMES R. ALLAN

JAMES R. ALLAN will be honored "for unswerving devotion to making the foundry a better and safer place to work, and for his leadership in developing practical engineering standards for the improvement of foundry working conditions." Prior to organizing a consulting service, Allan Industries Inc., Melbourne, Fla., in 1954, Mr. Allan had been associated with International Harvester Co., Chicago, for 44 years. During that time he was an active AFS committee member, prominent among his assignments being work on hygiene and air pollution control codes. He served as a national AFS director in 1936-39, and was presented the John H. Whiting Gold Medal in 1939.

BERNARD D. CLAFFEY

BERNARD D. CLAFFEY will be honored "for outstanding service to the society and the castings industry in the work of its chapters, technical committees, and educational development." Mr. Claffey's service to the industry dates back to 1915 when he joined the Spring City Foundry Co., Waukesha, Wis. From 1928 to 1945 he held management positions with Milwaukee Gray Iron Foundry Co., Claffey Casting Co., and General Malleable Corp. He joined Acme Aluminum Alloys Inc., Dayton, Ohio, in 1945 as vice president and general manager, and was elected president in 1949. In 1954 he became general manager of Ohio Malleable Div., Dayton Malleable Iron Co., at Columbus, and the following year was named general manager of the company's GHR Foundry Div. He was elected a vice president of Dayton Malleable this year. Mr. Claffey has been active in the AFS Education Division, was a national director 1940-43, and has served as a trustee of FEF.

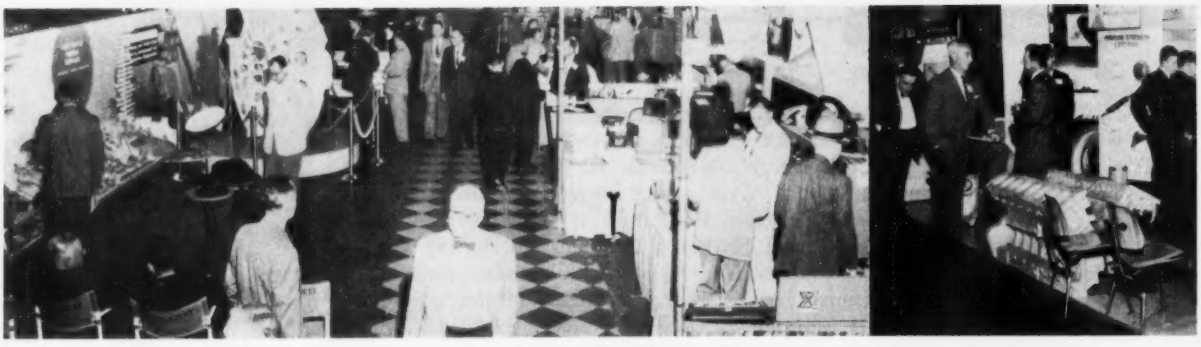
ROY W. SCHROEDER

ROY W. SCHROEDER will be honored "for long and devoted service to the society's apprentice training and foundry instruction, and for his unceasing guidance of young men toward foundry careers." Mr. Schroeder is associate professor of foundry and pattern laboratory, Navy Pier Branch, University of Illinois, Chicago. He has served for many years as chairman of the AFS apprentice contest committee and is vice chairman of the Education Division. Last summer he spent a month in Puerto Rico as advisor to the University of Puerto Rico in establishing a foundry section of its manufacturing process course.

LIFE MEMBERSHIP

LEWIS H. DURDIN

LEWIS H. DURDIN, as retiring national president of AFS, will receive an honorary life membership in the society. President of Dixie Bronze Co., Birmingham, Mr. Durdin was graduated from the University of Illinois in 1929 and from Babson Institute, Boston, in 1930. He held positions with Chicago Pump Co., Joy Mfg. Co., and Line Material Co. from 1930 until 1946, when he became president of Dixie Bronze Co. He is a past president of the Non-Ferrous Founders' Society.



ENGINEERED CASTINGS SHOW

List of Exhibitors

(Corrected as of March 23)

Adirondack Steel Casting Co., Watervliet, N. Y.
Aluminum Co. of America, Pittsburgh
American Brake Shoe Co., New York
American Smelting & Refining Co., New York
American Steel Foundries, Chicago
Apex Smelting Co., Chicago
Morris Bean & Co., Yellow Springs, Ohio
Bendix Foundries, Bendix Aviation Corp., Teterboro, N.J.
Berlin Chapman Co., Berlin, Wis.
Brillion Iron Works Inc., Brillion, Wis.
Brush Beryllium Co., Cleveland
Buckeye Brass & Mfg. Co., Mansfield, Ohio
Castall Precision Products Co., Chicago
Casting Engineers Inc., Chicago
Chicago Foundry Co., Chicago
Consolidated Foundries & Mfg. Corp., Chicago
Crucible Steel Casting Co., Milwaukee
Crucible Steel Casting Co., Cleveland
Curtiss-Wright Corp., Woodridge, N. J.
Curto-Ligonier Foundry, Melrose Park, Ill.
Devcon Corp., Danvers, Mass.
Dixie Bronze Co., Birmingham
Doehler-Jarvis Div., National Lead Co., New York
Dow Chemical Co., Midland, Mich.
East St. Louis Castings Co., East St. Louis, Ill.
Engineered Precision Casting Co., Matawan, N. J.
Fabricast Div., General Motors Corp., Bedford, Ind.
General Electric Co., Schenectady, N. Y.
Gillett & Eaton Inc., Lake City, Minn.
Hampden Brass & Aluminum Co., Springfield, Mass.
Harsch Ebaloy Foundries, Rockford, Ill.
Benj. Harris & Co., Chicago Heights, Ill.
Hica Inc., Shreveport, La.
Kaiser Aluminum & Chemical Corp., Chicago
Keokuk Steel Casting Co., Keokuk, Iowa
H. Kramer & Co., Chicago
R. Lavin & Sons Inc., Chicago
Lindgren Foundry Co., Batavia, Ill.
Love Bros. Inc., Aurora, Ill.
Lynchburg Foundry Co., Lynchburg, Va.
Magnaflux Corp., Chicago
Mall Tool Co., Chicago
Michiana Products Co., Michigan City, Ind.
Michigan-Standard Alloy Casting Co., Detroit
Mid-Continent Steel Casting Corp., Shreveport, La.
Midwest Pressure Casting Co., Chicago
Misco Precision Casting Co., Whitehall, Mich.

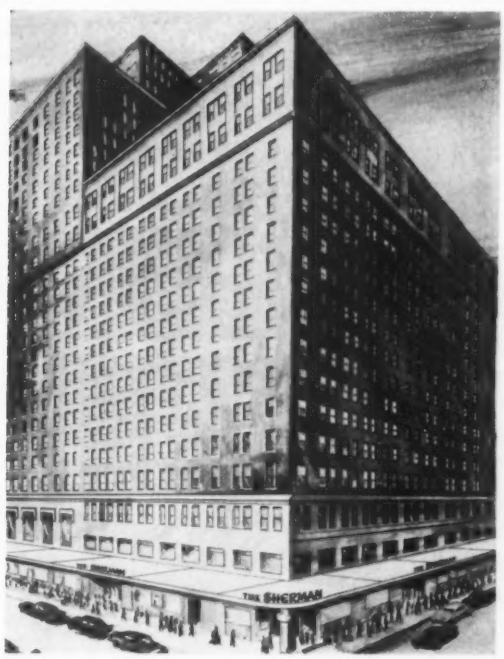
● ADAPTABILITY of castings to modern engineering applications will be demonstrated by the extensive exhibits to be included in the second Engineered Castings Show of the American Foundrymen's Society.

This show, to be held April 13-17 concurrently with the AFS Castings Congress in Chicago, will occupy the mezzanine floor of the Sherman Hotel. It is intended to present to designers and buyers of castings the information they require concerning efficient design, patterns, metals, process control, and casting properties. The society states that 50,000 designers have been contacted.

Among the 70 companies which will sponsor exhibits will be a representative group of producers of ferrous and nonferrous castings. Other exhibitors will include producers of casting metals and alloys; manufacturers of production analysis, inspection, and laboratory equipment for cast metals; and companies producing and marketing patterns and dies for metal casting.

The Show will be open during the following hours: Monday, 9 a.m. to 5:30 p.m.; Tuesday, 9:30 a.m. to 5:30 p.m.; Wednesday, 11:30 a.m. to 5:30 p.m.; Thursday, 9 a.m. to 5:30 p.m.; Friday, 9 a.m. to 3:30 p.m.

Motor Castings Co., Milwaukee
Mueller Industries Inc., Aurora, Ill.
Neenah Foundry Co., Neenah, Wis.
Paxton-Mitchell Co., Omaha, Nebr.
Pelton Steel Casting Co., Milwaukee
Pyott Foundry & Machine Co., Aurora, Ill.
Quality Aluminum Casting Co., Waukesha, Wis.
Rausch Mfg. Co., St. Paul
Remington Arms Co., Chicago
Roessing Bronze Co., Pittsburgh
Rolle Mfg. Inc., Lansdale, Pa.
Scientific Cast Products Corp., Cleveland
Shaw Process Development Corp., Port Washington, N.Y.
Sipi Metals Corp., Chicago
Sivyer Steel Casting Co., Milwaukee
Southern Precision Pattern Works, Birmingham
Stahl Specialty Co., Kingsville, Mo.
Superior Foundry Inc., Cleveland
Swedish Crucible Steel Co., Detroit
Universal Castings Corp., Chicago
Universal Foundry Co., Oshkosh, Wis.
WaiMet Alloys Co., Detroit
Waukesha Foundry Co., Waukesha, Wis.
Western Foundry Co., Holland, Mich.



The Engineered Castings Show will occupy the mezzanine floor of the Sherman Hotel in Chicago

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Questions and Answers

Moisture in material may not result in the desired effect on the iron . . . Addition of iron oxide augments the hot strength . . . Pinholes occur . . . Art work and sand . . . Cupro-nickel castings . . . Derivation of terms

Method May Have Drawback

We operate a foundry in South America and would like to know if soda ash or sodium carbonate crystals moistened with water and made into briquets will produce the same results in cast iron as soda ash products now on the market.

If the soda ash crystals were dampened just sufficiently to promote a slight adherence and the briquets were formed in a machine under a high enough pressure to produce practically a solid mass, it is possible that they would function satisfactorily. Because of the moisture content, however, we believe that the briquets would tend to disintegrate into powder or dust when they come into contact with heat either in the cupola or when placed on molten metal in a ladle. The fine material would be carried away by air currents and be wasted.

At least one type of soda ash product on the market is made by pouring molten soda ash into small molds. Melting temperature of soda ash is around 1560° F.

Increases Hot Strength

We operate a foundry in Argentina and will appreciate information on use of iron oxide to benefit core sand mixtures as well as to give hot strength.

In many foundries in this country 1 to 2 per cent red iron oxide is used in core sand mixtures to increase the hot strength. *Modern Core Practice* by Dietert indicates that addition of 2 per cent iron oxide to a mixture increases collapsibility at 2500° F from 3 minutes, 14 seconds to 5 minutes, 30 seconds or 70 per cent.

Iron oxide additions also help to reduce fissures and fins on cored surfaces of castings. Morey and Ackerlind in *Transactions*, American Foundrymen's Society, 1950, point out that iron oxide raises the strength of sand at nearly all temperatures, and raises the temperature at which maximum strength occurs by nearly 100° F. At temperatures above 2000° iron oxide causes a large increase in strength; at 2300 to 2500° F it amounts to 700 per cent.

Has a Problem with Cores

In our foundry in India we are using a core sand mixture containing 1½ to 2 per cent double boiled linseed oil and ½ to 1 per cent cereal. While the properties of the cores after baking are satisfactory, in the green state the mix has little flowability and does not strip clean from the coreboxes. We use only kerosene as the parting agent. As a result the cores require considerable finishing and painting. Can you offer any suggestions to eliminate sticking, improve surface finish and increase flowability?

Difficulty with the green cores sticking in the boxes undoubtedly is due to the type of linseed oil used. Possibly it may be remedied to some degree by addition of a diluent, such as fuel oil or kerosene, which will act as a lubricant. Try an addition of ¼ to ½ per cent by weight. Such an addition also will increase the flowability of the sand.

Stickiness of the linseed oil may be counteracted to some extent by increasing the amount of cereal binder to about twice that presently used or 1 to 2 per cent by weight. You do not indicate the moisture content in your present mixture, but if it is high, there is a tendency for cores to stick in the boxes. For cores made by hand the moisture may be around 5 per cent, and for cores blown on machines the moisture should be lower—about 2.5 to 3 per cent. Moisture content should be determined experimentally.

Machining Shows Pinholes

Under separate cover we are mailing to you a gray iron ring 5¾ in. OD, 3¾ in. ID, and ⅜ in. thick on which you will observe a number of small holes in one area revealed by the machining cut. Our laboratory reports were as follows: Carbon 3.58 per cent, silicon 2.28 per cent, and sulfur 0.093 per cent; sand moisture 4.2 per cent, permeability 88, and mold hardness 90. Can you tell us what caused this casting to be defective?

Inspection of the ring casting shows that the small holes—or pinholes as they commonly are called—are confined to one surface and one area in the vicinity of the gate. There are two possible causes of the defects.

If the holes are confined to the cope surface, the holes might be caused by air entrainment in pouring. However, we believe the more likely cause is gas penetration from the mold which arises from a combination of factors rather than a single one. We note that your molds have a high hardness, an excellent practice provided the sand has sufficient permeability to carry off the gases formed by contact of the molten metal.

Amount of gas formed will depend on the moisture in the sand, temperature of the iron, and the amount of molten iron that flows over a given area or period of contact at high temperature. In the gate area the iron is at higher temperature than in other parts of the

mold, so that more gas will be formed there than in areas farther away. Also, in the gate area all the molten iron passes over the sand, heating it to a higher temperature than other parts of the mold and creating more gas. Then there is the possibility that pouring temperatures are higher than usually employed.

We observed that the gate seems to be about $\frac{1}{8}$ in. thick and $\frac{3}{4}$ in. long. Possibly by increasing the height or thickness of the gate several advantages would be gained. With the larger gate the iron could be poured at a lower temperature, and with lower temperature less gas would be generated. Even without decreasing the temperature of the iron, the larger gate would permit the mold cavity to be filled much more rapidly and the period of time that molten metal would flow over the sand would be decreased accordingly. That in turn would mean a lower temperature of the sand face which would permit formation of a heavy skin not easily penetrated by the gas developed by contact of molten metal.

Blowholes Appear in Corner

We are forwarding for your examination a defective gray iron automotive manifold casting on which we would like an opinion as to the cause. The castings are made two in a mold. Total iron in the mold, 58 lb, is poured in 10 seconds. Each casting has two gates, and the iron charge is composed of 28 per cent malleable pig, 38.25 per cent remelt, 9 per cent cast iron scrap, 23 per cent steel scrap, and 1.75 per cent Ferrocarbo.

Composition shows about 2.25 per cent Si, 0.63 per cent Mn, and 0.20 per cent P. Ladle additions are made of 0.40 per cent Mo, 0.10 per cent Cr, and 0.05 per cent Si. Castings are poured at 2550 to 2750°F. Some days we have no defects and other days the defectives run up to 10 per cent.

The holes in the gray iron manifold, in our opinion, are blowholes resulting from a borderline sand condition. That condition is indicated by your mention of sporadic occurrence, large variation in pouring temperature, and the location of the holes. Those holes appear at the sharp re-entrant angle or internal corner which, as you undoubtedly know, causes problems in venting as well as solidification.

The venting problem is due to rapid heat penetration from two walls perpendicular to each other, thereby creating a large volume of steam or gas which has difficulty in escaping unless the sand is quite open. The solidification problem is formation of a hot spot due to heat concentration in the sand forming the corner.

It appears that the solution of your problem lies in better control of pouring temperature or sand condition or both. While we suspect that you can overcome the trouble by using pouring temperatures on the low side of the range you mention, we would prefer to change the sand characteristics. By that we mean increasing the permeability of the sand and perhaps decreasing the moisture content. Increasing the permeability will permit the gas or steam formed on contact of molten metal with the sand to escape more easily. Lower moisture content decreases the amount of steam formed, but moisture reduction has to be applied with considered judgment.

You probably could eliminate the trouble by heavy application of the vent wire in the affected area, but that is an additional step which tends to slow down production. Also, the molder may forget to use the vent wire, or not use it enough, which leads to undependable results.

Blowhole occurs at sharp re-entrant angle on casting

Vacuum Testing Procedure

An article in the January issue, "Produces High-Quality Aluminum Castings" by W. B. Corcoran Jr., mentions a vacuum testing process on page 88. We are interested in this and would like to know the vacuum employed, size of specimen and other information along the line of procedure which might be available.

We understand that the specimen used for qualitatively determining the gas content in metals and alloys by the vacuum procedure weighs about 2.5 to 3 oz for aluminum and about $6\frac{1}{2}$ to 8 oz for copper-base alloys.

A small graphite crucible about 2 in. in diam is used to hold the molten metal dipped from the melting crucible. It is placed as quickly as possible under the bell jar, which is about 7 in. in diam and about 15 in. high. Bell jar is positioned on a platen or table containing an opening which may be connected to the vacuum pumping equipment, or opened to the atmosphere. We understand that the specimen is subjected to vacuum pumping for about 7 minutes, at which time the vacuum gage shows a reading of about 29 in.

The specimen is removed from the crucible, sawed in half, and the face filed smooth. Surface is examined under a magnifying glass

for gas porosity. When metals and alloys are allowed to solidify under vacuum, any gas present expands considerably, creating relatively large voids which are much easier to see.

Sand Problems in Art Work

I have a small art foundry, and all work is individual ranging from small flat medallions to 3 x 6 ft plaques in one piece with 12 in. figural undercuts. I also do statuary work. Both are made in piece molds. The lost wax process is used with sculptures which have undercut surfaces. Bronze, aluminum, and white metal are poured.

My problems are different from industrial ones, being in sand, binder, and in keeping the surface of the casting resistant. I have problems with sand erosion. The French sand I am using has too much clay, and molds crack when baked. I tried Albany sand bonded with molasses, but it was not strong enough and broke down on large areas. Are there any books on the subject of sand molding statuary and ornamental castings?

Answering your last question first, we do not know of any book on sand molding practice for producing statuary and/or ornamental castings. From time to time general descriptions have appeared in the literature but they do not go into much detail. While you state that your problems are different than industrial ones, we think that basically they are the same.

New or unused French sand is subject to cracking from shrinkage, and the general practice is to use a mixture of old or used sand and new sand. Again the difficulty may arise from not ramming it hard enough, or possibly the flasks are not rigid enough. French sand, when properly rammed, bonds tightly together to form a stiff structure, but there are limitations on what it will withstand.

Your mention of using Albany sand bonded with molasses presumably refers to the procedure of spraying the finished mold face with molasses water and drying it with a torch. With reference to lack of strength, it may be that you expect the Albany sand to have the properties of the French sand. That is not possible, but an approach may be made by increasing the bond by addition of clay, cereal, lignin (sulfite pitch), etc.

Again the difficulty may be that you do not have sufficient bars in the flask to offer support to the sand. Possibly your difficulty with erosion is that you do not employ sufficient gates into the cavity. Where considerable molten metal must flow over a given area of sand it will tend to erode. Remedy is to use multiple gating to reduce the flow over any specific area. That also permits lower pouring temperature.

Melting of Copper-Nickel

We are quoting on some 90-10 copper-nickel alloy castings, and as this is our first experience with such alloys, we will appreciate proper procedures for melting and molding.

You would have been in a much better position had you obtained the information desired and carried on some experimental work before making the quotations, but you may be fortunate and not run into some problems.

Melting practice for copper-nickel alloys should follow that ably described by Kihlgren some years ago with reference to the 70 Cu-30 Ni alloy. In this practice the copper and nickel are melted together under slightly oxidizing conditions and then the melt oxidized with either copper or nickel oxide, using virgin metals. If appreciable copper-nickel return scrap is employed, the oxidation may not be necessary.

Amount of nickel or copper oxide is 1¼ or 3½ oz per 100 lb which should be stirred in vigorously. After the oxidation treatment, the remelt, preferably cleaned by blasting, is added. About 3 to 5 minutes before pulling the pot, additions of 97 per cent manganese and refined silicon metal (low carbon) are added for deoxidation. When the pot is pulled, addition of 0.025 to 0.05 per cent metallic magnesium is made to counteract sulfur pickup.

In the case of the 70-30 alloy the manganese and silicon additions are such as to give 1.20 per cent Mn and 0.55 per cent Si in the metal. However, some specifications for 90-10 alloy indicate a maximum Si content of 0.10 per cent, so you should be governed accordingly. Pouring temperature range for the alloy is 2500 to 2650° F depending on section thickness.

Due to the high pouring temperatures, the molding sand should be refractory and fairly high in permeability. A synthetic sand with an AFS grain fineness of 40 to 60 with about 14 per cent clay and 4.5 to 5.5 per cent moisture should serve. Mold surfaces may be coated with dry graphite by dusting or brushing. Cores should be moderately soft, well-vented, and should collapse readily. Graphite, silica, or other suitable core wash may be used.

Heavy sections of copper-nickel alloy castings must be risered adequately and/or chilled to promote progressive solidification. Preferable method is to gate into the heavy sections through risers which place the metal where it is needed.

Traces Some Foundry Terms

Could you supply us with any information on the derivation of the following foundry terms: Cope, cheek, drag, gating or gates, scab, and buckle?

Brief search indicates the following as possible origins of the various terms you mention:

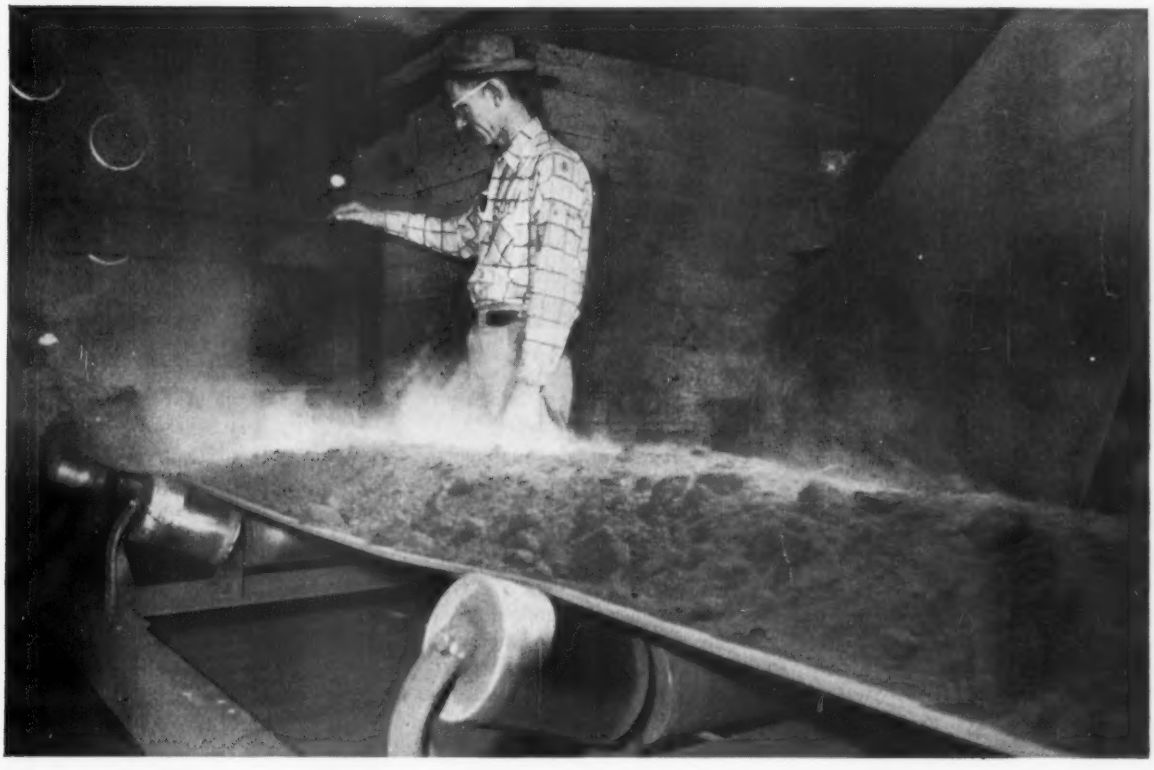
Cope may be derived from the medieval Latin *cap* or *cappa* meaning a cape or cover as well as the top or uppermost part. One definition for cheek is those pieces of a machine or of any timber or stone work which form corresponding sides, and also as being the section of a flask so made that it can be moved laterally to permit removal of the pattern from the mold. Presently the word "cheek" means those sections of a mold between the cope and drag.

The word "drag" may be derived from the old Saxon *dragan*, meaning to bear or carry, whence its application to the lower part of the mold which bears or supports the cope. The word "gate" appears similar to the old Saxon *gat*, which means an opening or hole.

Presumably, the term "scab" is based on its resemblance to the incrustation on a sore or wound. Buckle, in addition to other meanings, includes a bend or kink, distortion, bulge, which are descriptive of the surface of a casting or mold where sand expansion has occurred.

US RUBBER FOUNDRYGIANT CONVEYOR BELT

Tramp Iron can't go on a TEAR on this belt!



Hot foundry sand loaded with jagged pieces of tramp iron is a murderous combination for a conveyor belt.

That's why this leading Southern foundry uses U. S. FoundryGiant *RipStop* Conveyor Belts. These special heat-resistant belts have rip-stopping wire ribs imbedded in the carcass across the belt at 3' intervals to prevent the jagged pieces of metal flash, sprues, gates, geigers, etc., from going on a tear and wrecking the belt. Where previous belts lasted only 2 or 3 months, the "U. S." belts are lasting 8 times as long!

Two FoundryGiant cotton-nylon belts convey the tramp-infested hot sand from both the shakeout and sand-slinging unit to storage bins. These thinner belts, made possible by the considerably stronger cotton-nylon carcass, allow for much more efficient tramp iron removal by keeping the load closer to the core of the magnetic field of the head pulley.

"All in all," says the master mechanic of this smooth-running foundry, "these belts save us about 500 man-hours a year in belt repair and replacement. We're very happy with their performance."

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Steel Founders Step Up

PROGRAM FOR MANAGEMENT

By FRANK G. STEINEBACH
Editor

The Frederick A. Lorenz memorial medal of SFSA was awarded to B. P. Hammond, left, for outstanding service to the steel castings industry. I. M. Emery, right, received the group's Technical and Operating medal

● MEMBERS OF THE Steel Founders' Society of America, at the organization's 57th annual meeting, held at the Drake Hotel, Chicago, March 9-10, reviewed the past year's work and accomplishments, considered plans for an expanded program of activities, and learned of some of the problems pressing our country and our civilization.

Ross L. Gilmore, society president and president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., reported on the three broad areas of work of that organization, namely management, market development and technical. The new Management Accounting Program Committee already has released the first of a series of studies dealing with various aspects of management control through accounting procedures. The society has changed to a monthly collection of complete profit and loss statement data and other reports such as a quick trend, statistical summary, lost-time injuries summary, etc.

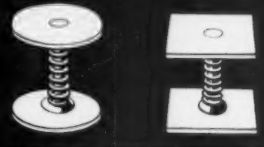
Four issues of the management letter, periodic labor relations reports, and timely bulletins on many subjects are mailed to management. The president also reported that an Aircraft Castings Policy Advisory Committee has been appointed. The society has become a member of the American Standards Association and secured representation on Committee B-31, pressure piping, sponsored by the American Society of Mechanical Engineers.

Ross L. Gilmore, left, SFSA president, presents the Gustav A. Lillieqvist award to, left to right, Wendell W. Snodgrass, John W. Wasem, and Jerry M. Hathaway, for the 1958 prizewinning paper published in *Steel Foundry Facts*

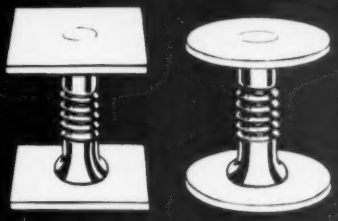
The product and market development program during the past year included four regional conferences, a conference with the Army Engineers Corps at Fort Belvoir, Va., the mailing of four issues of the Product and Market Development letter, publishing six product design studies, and correcting the direct mail list so that 40,000 customers and prospects now are receiving advertising material from the society. The educational program continues to improve in quality and quantity, and the list of college professors receiving material from the society has been increased from 1200 to 4000. The society is making five films on steel castings available to engineering schools.

In the research field, three new projects have been started: Project No. 46 on casting tolerances; Project No. 47 on determination of the distance a riser will feed sections equal to or greater than 4 in.; and Project No. 48, determination of the factors producing a ceroxide defect. Part one of Project No. 42-A conducted for Watertown Arsenal and the Ordnance Department has been completed, and a

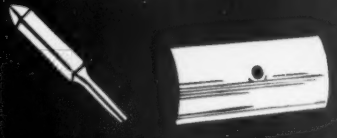
Cleveland Radiator Chaplets — include both popular open flat coil head and regular plate heads . . . in all styles and finishes.



Motor Chaplets — made with annular fusion rings for uniform knitting and maximum core support; also with wide radius shoulders that eliminate gas-collecting voids under the heads.



Double-Head Chaplets — used for heavier metal sections, these chaplets are accurately made of low carbon steel and carefully tinned. Also produced in heavy and extra-heavy sizes.



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Enjoy high casting quality every time with Cleveland Chaplet's popular precision-made and accurately finished chaplets. Here's accurate core support that helps hold down molding and cleaning costs, simplifies your inventory, too, because you can rely on Cleveland's prompt, dependable service.

For chaplet detail... request Cleveland's up-to-date catalog TODAY!

CLEVELAND chaplet **SINCE 1890**

AND MANUFACTURING CO.

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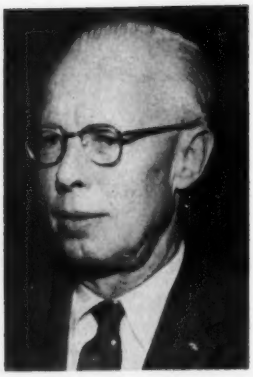
ROSS GILMORE
President



J. R. PATTERSON
Vice President

report, "Effect of Heat Treatment Variables on Toughness of Cast Steel," has been sent to the Arsenal and released to SFSA members. Work on part two of the project also is complete and a preliminary report has been sent for review.

During the year a research report "Sodium Silicate-Carbon Dioxide Inorganic Bonds for Molds and Cores" was released. The society published two raw materials specifications during 1958—namely, 20T59 "Cast Steel Abrasives" and 21T59 "Malleable Iron Abrasives." Specification 11T59 "Zircon Sand and Flour," which was issued in 1957, was revised last year.

Papers at the 13th annual Technical and Operating conference on "Flow of Steel in Molds" have been prepared in book form and are available to members. It also was noted that the lowest accident frequency record in SFSA history was experienced in 1958. The new low was 14.0 which compares with the previous low point of 16.2 in 1954.

The president stressed the belief that the only excuse for the existence of the Steel Founders' Society of America is to assist its members to realize a return from their operations that is commensurate with the amount of capital which they employ, the volume of sales which they produce, and the efforts they expend in the operation of their business.

F. Kermit Donaldson, executive vice president, stressed the fact that changes in practice and the movement to lighter section designs plus changes in labor and social legislation have made old methods of measuring performance and progress obsolete. Measuring in terms of tonnage, as at present, or in terms of dollar sales does not reflect accurately the position of the industry or where it is going.

In Mr. Donaldson's opinion, purchasers of steel castings are buying strength, strength enough to do the job for which the castings were intended or for which the machine or equipment using the castings was designed. With this in mind, the speaker suggested the possibility of developing a measure which would reflect the technological changes in the market for steel castings and show what is happening to the industry as a whole, against which an individual company could measure its performance.

In developing a suggested measuring method, Mr. Donaldson considered the periods 1946-50 and 1956-58 and multiplied the average tonnages of both carbon steel and alloy steel castings by an assumed average yield strength, which, he pointed out, was on the conservative side. The product of this multiplication was called "strength units." Although the figures are not exact and will require more detailed study, Mr. Donaldson indicated they provide an interesting measure of progress.

These figures show that the average customer received 18½ per cent more "strength units" per pound of cast steel purchased during 1956-58 than he received during 1946-50. Pound for pound, according to Mr. Donaldson, he received, on the average, nearly 20 per cent more intrinsic value. Such progress shows that perhaps steel foundries are keeping up with the general progress of the national economy.

To increase the value of such knowledge, it must be translated into terms the customer understands. Due to changes in strength requirements, the pounds of cast steel the customer buys today may cost twice as much or more to produce, omitting entirely the effect of increases in labor costs. The customer must understand this fact. And the foundryman should know what is actually being produced and sold, and how much it costs

Joseph B. Terbell, left, and Morris E. Neeley Jr., right, were presented special certificates for their service with the Castings Branch, Iron and Steel Division, BDSA. Harry Wanner, BDSA, center, made the presentations

HANDY SANDY . . .

beats a tough assignment in a prominent steel foundry

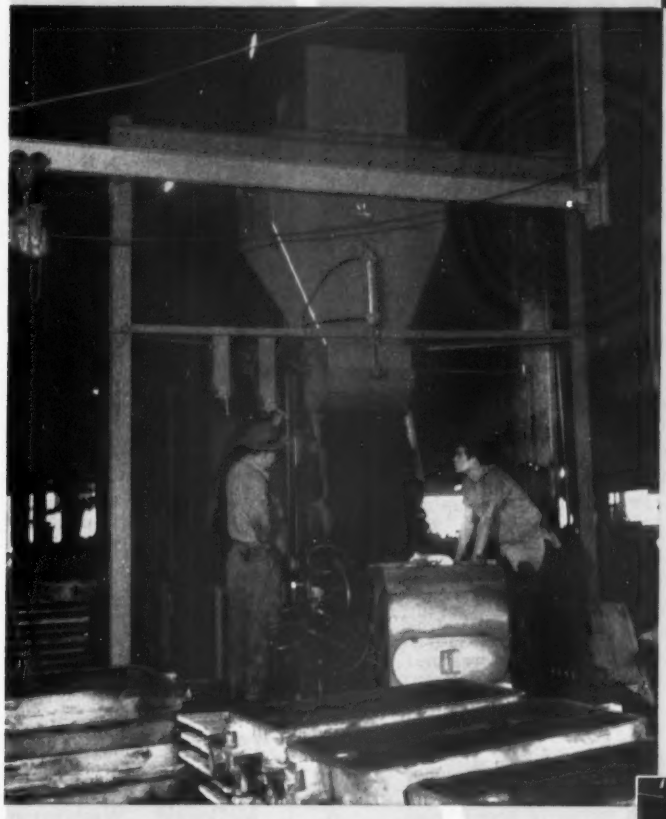


Photo above shows one of the Handy Sandys that provides sand for a large roll over machine.

Newaygo Handy Sandys are a "natural" for steel foundry molding operations. They are engineered like most Newaygo Foundry Equipment — to do a specific job, and do it better.

In this case, these special designed Handy Sandys include as standard equipment Belt-Type Elevators and a special Discharge Baffle on the elevator head to prevent sand from sticking at the discharge point. The overhead Aerator also has separate motor drives to give increased speed as well as aeration to the sticky sand. Removable, hardened aluminum lining is standard in the Overhead Hopper to assist proper flow of sand through the gate.

The two Handy Sandys in this foundry have been in operation for over six months. No trouble of any kind has been experienced in handling the sticky sand. No appreciable amount of maintenance has been required.

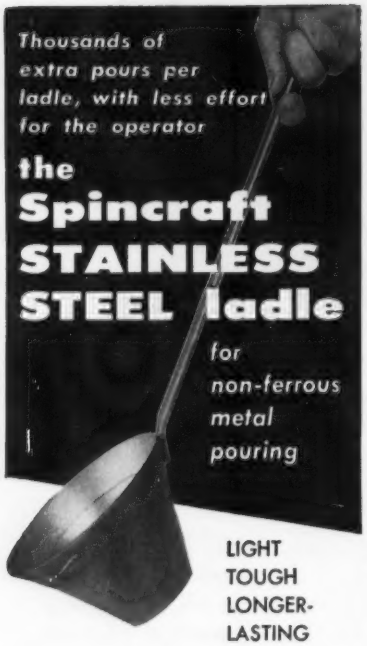
Photo at right shows one of the Handy Sandys that provide overhead sand for a Cope and Drag operation. With this set-up three men are doing the work of four, and are producing 25% more molds per hour at a large reduction in molding costs.

"Foundry Business is BIG Business"

Send for your copy of "Planned Mechanization for Foundries."

NEWAYGO engineering company
NEWAYGO, MICHIGAN

. . . and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT



LIGHT
TOUGH
LONGER-
LASTING

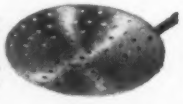
If you pour non-ferrous alloys, Spincraft ladles will save you replacement costs and make the job much easier. Designed to reduce operator fatigue by their lightness, balance, and non-spill shape, they resist burning-through as only stainless steel with its high critical melting point can do. Spincraft ladles come in 23 sizes, from ¼ lb. to 30 lb. molten metal capacity.

- 75% lighter than cast iron ladles
- Amazingly long life
- Shot-blasted for coating adhesion
- Deep conical form makes pouring easier, minimizes spillage
- Can be used for zinc and other metals without coating
- "Whack proof" handle arc-welded to reinforced cup edge
- Built to last longer, work lighter. Let your operator use one, then try to take it away from him!

Complete handle on ¼ lb. through 9 lb. size; 10 through 30 lb. size has handle bracket stub to which proper length handle can be attached.

Also...Spincraft STAINLESS STEEL Skimmer

A skimmer that really skims! Shallow radius skims surface impurities instead of ladling as deeper-cupped skimmers do. Correct size holes prevent clogging. Short handle stubs fit common pipe and permit attachment of length and type handle you want.



IN FOUR DIAMETERS: 6 inch, 8 inch, 10 inch, 12 inch.

Spincraft ladles and skimmers are also available in low-cost mild steel.

Spincraft
SKILL WILL DO IT
INCORPORATED

Write for complete data and prices today.

SPINCRAFT, INC.
4124 West State St., Milwaukee, Wis.

Send us complete information on:

Stainless Steel	Mild Steel
☐ Ladles	☐ Ladles
☐ Skimmers	☐ Skimmers

Company .....

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City ..... State .....

Name .....

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to do it. In conclusion, Mr. Donaldson referred to the new Management Accounting Program of the society. It has been established to provide knowledge on indirect costs and overhead, which have reached large proportions.

Discussing "How does technical research affect the economy of the steel casting industry?" Charles W. Briggs, technical and research director, pointed out that research and development expenditures in the United States increased from $5.4 billion in 1953 to $10 billion in 1957. An estimated $12 billion will be spent in 1959. The fabricated metal products and ordnance category, which includes steel castings, will spend approximately $240 million, an increase from 1952 to 1959 of 233 per cent. He reported that the society's research expenditures increased from $55,000 in 1944 to $122,000 in 1959.

Basic Research Is Limited

Mr. Briggs stated that the field of basic research in steel castings is rather limited. Therefore, most research in the field becomes applied research and development. Research in steel castings is primarily one of carrying forward studies in the processing of steel castings. The field is one of developing a higher quality product and of finding improved processing methods which may result in lowering production costs.

Mr. Briggs pointed out that applied research and development, together with publicity about these developments, can instill confidence in engineers and designers that steel castings are synonymous with the highest quality desired by the service. He concluded that technological research in steel castings is a profitable activity.

W. W. Heimberger, Buckeye Steel Castings Co., Columbus, Ohio, chairman of the New Handbook Committee, pointed to the values provided the steel castings industry through the publication of the first edition of the *Steel Castings Handbook* in 1941 and the second edition in 1950. Work now is starting on the third edition, scheduled for publication in 1960.

This will provide a complete revision of the book with special emphasis on information for engineers, designers and students. It is expected that some streamlining of manufacturing details will be undertaken. The chairman stated that the detailed outline for the new edition is well underway and that the work of collecting data and photographs is starting. He asked the help of both individuals and companies in the project.

George K. Dreher, marketing development director, considered the subject "Marketing—Fad or Fundamental." In introducing the talk, he pointed to a number of fads which were embraced by the foundry industry in the past, but over the years have developed into sound fundamentals of present day industrial operations.

The marketing idea actually had its beginnings in the consumer industries. During the past decade, and particularly since development of the Standard Industrial Classification Code has made it possible to break down the fields of use, marketing has moved more deeply into the industrial field. Although the idea at first may have appeared to be a fad, the fact remains that a fundamental core persisted, and marketing now has emerged as a useful and necessary tool for the metalworking industries.

Mr. Dreher then outlined the function of marketing in a modern industrial organization. Much of the discussion on that subject is contained in the extensive article which he prepared for presentation in this issue of FOUNDRY, starting on Page 100.

A. J. McDonald, Washington representative of SFSA, outlined a number of activities in Washington which affect the steel foundry industry.

Harry L. McClees, president, Crucible Steel Castings Co., Lansdowne, Pa., and chairman of the recently organized Management Accounting Program Committee, reported on a recent study which indicated the need for better cost control information. Mr. McClees stated that the most important problem in costing is the computation, distribution and control of manufacturing overhead. In his opinion, management is the proper place to place responsibility for cost control.

Mr. McClees made the interesting observation that management pays close attention to fringe benefits for labor, but gives minimum

The "Banjo" Could have had Weak Spots

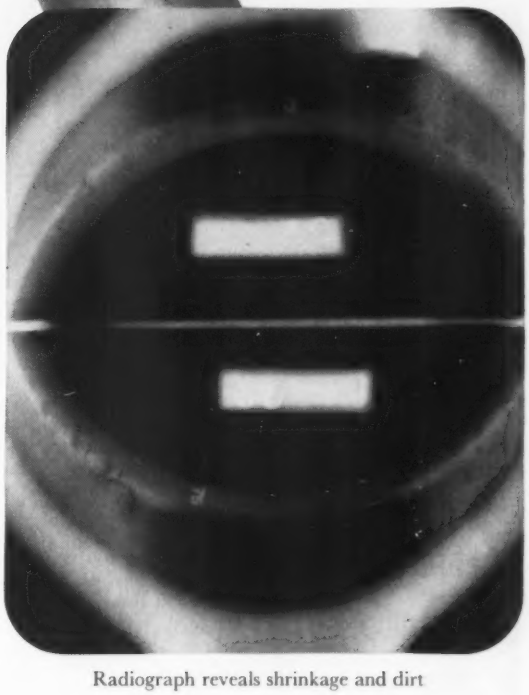
Casting made by Riverside Foundry for gear housing of four wheel drive truck.

Casting this gear housing presented problems. Yet it had to be sound because it was destined for service in rugged, four-wheel drive trucks.

To be sure that it would be ready for its job, the Riverside Foundry, Bettendorf, Iowa, x-rayed the pilot castings. The radiographs showed shrinkage and dirt inclusions. Changes in casting technic followed. Radiography proved the difficulties were overcome.

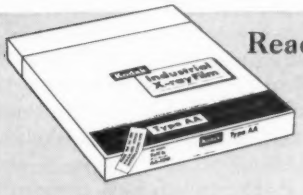
This is another example of how radiography quickly points the way to sound production—provides assurance that only high-quality work is delivered.

This is the way to build business. You should take advantage of radiography. If you would like to know how it can work profitably for you, talk it over with an x-ray dealer or write for a Kodak technical representative to call.



Radiograph reveals shrinkage and dirt

X-ray Division . . . EASTMAN KODAK COMPANY . . . Rochester 4, N.Y.



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Industrial X-ray Film
Type AA

Read what Kodak Industrial X-ray Film, Type AA, can do for you:

- Speeds up radiographic examinations.
- Gives high radiographic contrast, increased detail and easy readability at all energy ranges.
- Provides excellent uniformity.
- Reduces the possibility of pressure desensitization under shop conditions.

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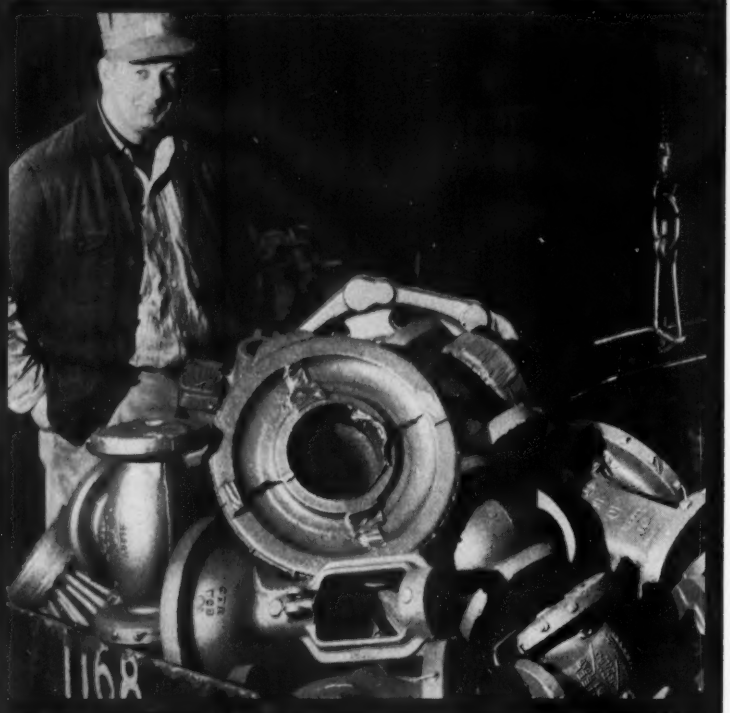
Circle 632 on Page 53

ROTOBLAST® STEEL SHOT CUTS COSTS 37%



Rotoblast Steel Shot reduces abrasive consumption 37% at Ft. Pitt

Ft. Pitt Steel Castings Div., Pittsburgh Steel Foundry Corp., McKeesport, Pa., really put Pangborn's New Rotoblast Steel Shot to the test! Ft. Pitt ran a careful six months study using S-460—involving hundreds of hours of operation—comparing Rotoblast to the best steel shot the company had found previously. Both abrasives were tested under the same conditions in a 72 cu. ft. Rotoblast Barrel.

The result: The consumption of Rotoblast Steel Shot ran *37% below* the other abrasive. Since cost-per-ton is approximately the same for both abrasives, Rotoblast Steel Shot has cut Ft. Pitt abrasive costs by more than ⅓!

The durability of Rotoblast Steel Shot is due to its unique method of manufacture. The Pangborn man in your area can tell you about it. Or write PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment, Rotoblast Steel Shot and Grit.*

Pangborn

ROTOBLAST STEEL SHOT AND GRIT

or no consideration to what he termed "fringe benefits to customers." Technological progress and constantly increased demands from users are not being given proper consideration in determing the full cost of production.

Other speakers included George Sullivan, editor, *Iron Age*, who spoke on "A New Dimension in Marketing;" Mayor H. Roe Barth, Kansas City, Mo., who addressed a luncheon meeting on "Stand Up and Be Counted," and Dr. Walter H. Judd, congressman from Minnesota who spoke on "Where Do We Stand Now in Our World Relations?" While Congressman Judd was pessimistic about some of our national thinking, he felt that a show of force has prevented war on numerous occasions in recent years and will do so again in the case of Berlin.

Officers Are Elected

R. L. Gilmore has been re-elected president of the society, and J. R. Patterson, vice president and division manager, Mackintosh-Hemphill Div., E. W. Bliss Co., Pittsburgh, has been elected vice president. R. G. Parks, treasurer, National Malleable & Steel Castings Co., Cleveland, has been re-elected treasurer. F. Kermit Donaldson, Steel Founders' Society of America, continues as executive vice president and secretary; Charles W. Briggs, as technical and research director; George K. Dreher, as market development director; and Erwin Dieckmann, as assistant secretary.

The new board of directors is as follows: C. C. Brownmiller, manager of casting sales, Treadwell Engineering Co., Easton, Pa.; J. R. Patterson, vice president and division manager, Mackintosh-Hemphill Division of E. W. Bliss Co., Pittsburgh; B. V. Thompson Jr., vice president, Texas Steel Co., Ft. Worth, Tex.; C. H. Welch, president, Alloy Cast Steel Co., Marion, Ohio; F. B. Powers, vice president and sales manager, Burnside Steel Foundry Co., Chicago; W. A. Miller, president, Keokuk Steel Casting Co., Keokuk, Iowa; F. G. Frink Jr., vice president, Washington Iron Works, Seattle.

B. P. Hammond, vice president, eastern casting sales, Foundry & Mill Machinery Division, Blaw-Knox Co., Pittsburgh, and retiring

vice president of the society, was awarded the Frederick A. Lorenz memorial medal of the society for outstanding service to the steel castings industry. Mr. Hammond has been active in society work since 1945 when he became alternate director of Division 4. In 1947 he was made director of Division 4 and was elected vice president the same year. In 1955 he again was elected an alternate director of Division 4 and in 1956 was appointed to the Product and Market Development Committee. In 1957 he became director of Division 4 and again was elected vice president of the society. He also served on the Executive and Budget Committees.

The Technical and Operating medal of the society was awarded to I. M. Emery, president, Massillon Steel Castings Co., Massillon, Ohio, for his outstanding contributions to the technical and operating development of the steel casting industry. His association with the society started officially with his appointment to the Occupational Classification Committee in 1945. In 1946-47 he served as T and O chairman of Division 5 and represented that division on the national T and O Committee. Since 1946 he has been chairman of the T and O Committee and has served as ex-officio member of the Product and Market Development Committee.

The Gustav A. Lillieqvist *Steel Foundry Facts* award of $100 was won by Jerry M. Hathaway, Wendell W. Snodgrass, and John W. Wasem, Massillon Steel Casting Co., for their paper "Quality Improvement Program—A Sheave Casting" published in the April, 1958, issue of *Steel Foundry Facts*.

Second prize of $50 in this award went to Jack R. Irish and Harry B. Hunt, Texas Foundries Inc., Lufkin, Tex., for their paper "Methods Analysis and Work Simplification," in the February, 1958, issue of *Steel Foundry Facts*.

Special certificates were presented Morris E. Neeley Jr., sales manager, Dodge Steel Castings Co., Philadelphia, and Joseph E. Terbell, American Manganese Division, American Brake Shoe Co., New York, for their service with the Castings Branch, Iron and Steel Division, BDSA.

CUTS MAN-HOURS 38%

Pangborn Rotoblast cuts man-hours per day from 24 to 15 at Meadville Malleable Iron

The investment in a new 20 cu. ft. Pangborn Rotoblast Barrel has really paid off for Meadville Malleable Iron Co., Meadville, Pa.! By switching from a competitive barrel of about 12 cu. ft. capacity, the firm now cleans loads three times as large in half the time. Today tote box loads averaging 1900 lbs. each are cleaned in 4—5 minute cleaning cycles. As a result, the Rotoblast Barrel has cut 24 man-hours per day to 15 man-hours in the cleaning department and greatly improved the quality of the work.

How much time and money can Pangborn Rotoblast save you? It would pay you to talk to the Pangborn man in your area. Or write PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

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CLEANS IT FAST WITH ROTOBLAST®

Circle 634 on Page 53

Industry Briefs

● **AELCO FOUNDRIES INC.**, Milwaukee, is under new management with the purchase of 75 per cent of the stock by a group of Milwaukeeans headed by Eugene Huebner, former personnel director, Wehr Steel Co., West Allis, Wis. Mr. Huebner has been elected president, succeeding A. F. Lauersdorf, one of the founders of the firm, who remains in an advisory capacity. Other officers are Floyd J. Kops, vice president and general counsel, and Edgar W. Loke, who was re-elected secretary-treasurer.

Port Shell Molding & Engineering Co., Port Washington, Wis., has purchased Pewaukee Foundry Co., Pewaukee, Wis., which has been closed for almost two years. Port Shell will close the Port Washington plant and move to Pewaukee, where $5000 to $10,000 will be spent for remodeling.

American Railway Car Institute reports that January orders for new freight cars totaled 4007, compared with 401 a year ago. Of the 17,546 new freight cars ordered during 1958, 10,125 were ordered in November and December.

Reichhold Chemicals Inc., White Plains, N. Y., has made Hasting Plastics Inc., 1551 Twelfth St., Santa Monica, Calif., its southern California outlet for the company's line of basic polyester, polyurethane, and phenolic resins for aircraft and missile applications.

Oil City Iron Works, Corsicana, Tex., has become the second foundry in the state licensed to manufacture castings of Meehanite metal.

Bohn Aluminum & Brass Corp., Detroit, has expanded its sales coverage into two new three-state areas. Philip T. Miner, 4211 Somerville Ave., Dallas, Tex., has been appointed sales agent for Texas, Louisiana, and Oklahoma. Carl Olin, 4210 W. 62nd St., Los Angeles 43, will cover California, Arizona, and Nevada.

Hansberg Shooters Inc., 3213 Central St., Evanston, Ill., exclusive representative of Fritz Hansberg, Modena, Italy, manufacturer of Hansberg core shooters, also has become exclusive representative of Roeperwerk, Duelken, West Germany, for the United States and Canada. Roeperwerk manufactures Hansberg shooters under license and also builds a line of Komax-CO_2 gassing machines and combinations of Hansberg shooters and Komax gassers, as well as some rollover and stripping machines.

Air Reduction Sales Co., New York, has completed a new facility for production of oxygen and nitrogen at 1100 Packard St., Kansas City, Kans. It replaces a facility at 1000 W. 26th St., Kansas City, Mo., which has been closed.

Kwik-Mix Co., division of Koehring Co., Port Washington, Wis., has appointed Ensminger & Co., South Franklin and West Streets, Wilkes-Barre, Pa., to distribute its Moto-Bug material handler in 18 northern Pennsylvania counties.

Industrial Heating Equipment Association reports that net new orders for industrial furnaces in January totaled $3,518,000, compared with $3,045,000 a year ago. January net orders for induction heating equipment amounted to $1,004,000, highest since August, 1957, and 60 per cent more than in January, 1958.

"Be a little late, dear. I'm tied up on the pouring platform"

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has appropriated $832,000 to cover its capital expenditure program for 1959. Most of this amount will be used to continue replacement of open-hearth furnaces with electric furnace facilities and thereby increase production of high-alloy and stainless castings.

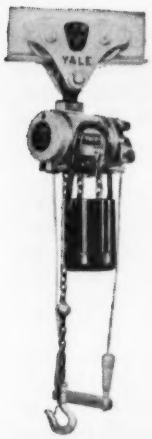
Claude B. Schneible Co., Detroit, has purchased McDaniel Tank Mfg. Co., Holly, Mich., producer of pressure tanks and other metal products. Schneible will continue this production and also will use part of the facilities for fabrication of its air pollution control equipment.

Canton Malleable Iron Co. and **Canton Mfg. Co.** have been sold to the Penn Machine Co., Johnstown, Pa., and will continue operations with Richard Wright as president and Leo Kelly, executive vice president.

Crane Co., Chicago, is discontinuing production of cast and malleable iron fittings and unions. These items will be purchased from jobbing sources. The company will continue the manufacture of steel, iron, and brass valves, flange fittings, and plumbing brass.

Roto-Finish Co., Kalamazoo, Mich., has purchased Ransohoff Inc., Hamilton, Ohio. Both firms produce various types of metal treating equipment. No major changes are contemplated in the personnel or operations of Ransohoff.

Ti-Co Industries Inc., Curtisville, Ind., has completed a storage building which adds about 1000 tons to the company's cob storage facilities. Stockholders and directors recently re-elected H. P. Crouch,

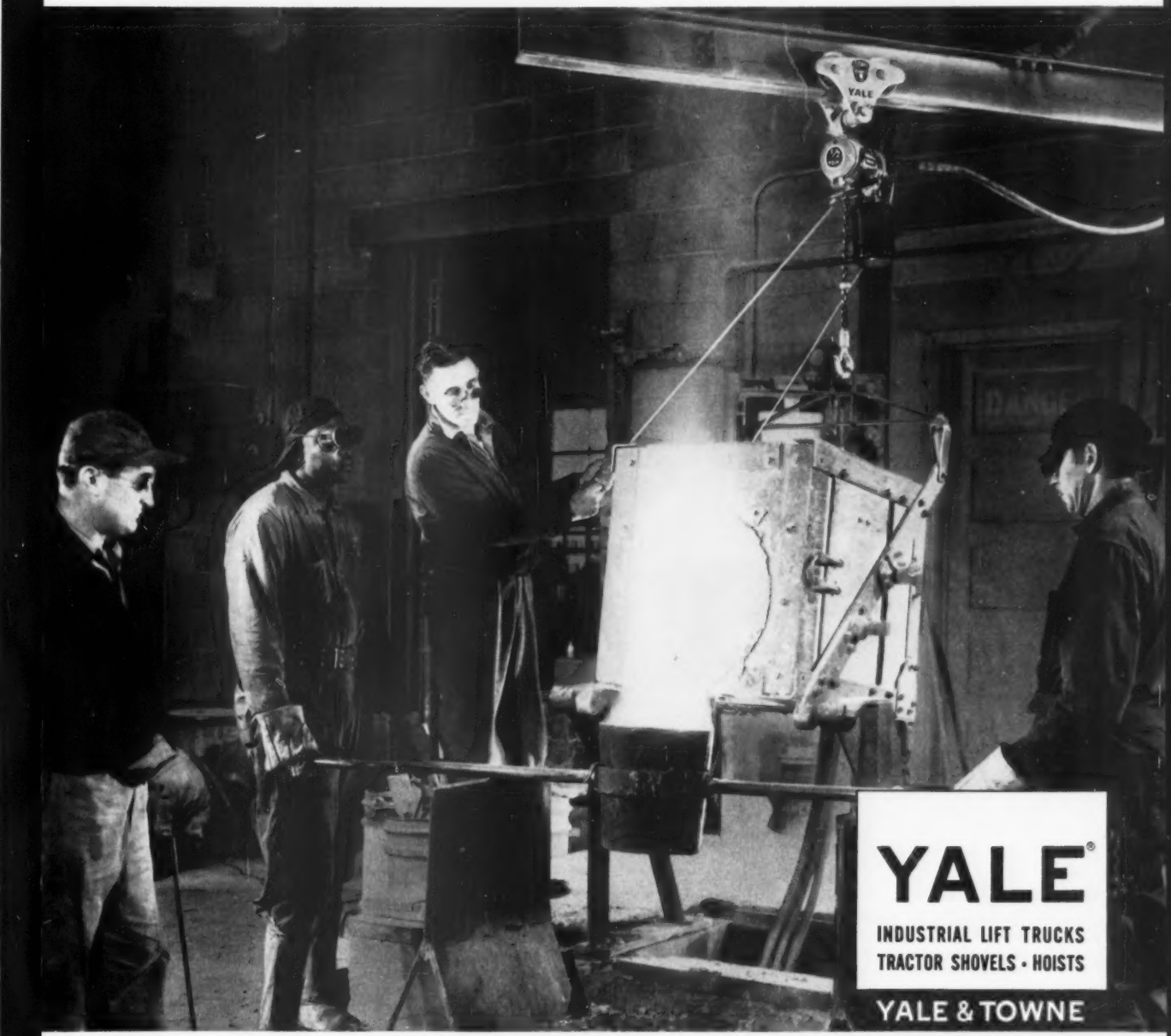


NEW YALE AIR HOISTS SPELL DOUBLE SAFETY

Protect Against Explosion
Protect Against Product Damage

Where your overhead handling jobs must be performed in a hazardous atmosphere, the new Yale Air Hoists provide the margin of safety you need. Air motor is explosion-proof—will not overheat. Constant variable speed-control allows smooth lifting and lowering—decreases danger of spillage or product damage. These light, compact hoists provide almost silent operation. Motor cannot burn out—automatic brake locks when power is off. Maintenance is minimized due to fewer moving parts—a real economy feature.

Capacities, ½ and 1 ton—hook or trolley models—roller or link chain—pendent or pull-cord control. For complete information on the new Yale Air Hoist—newest member of Yale's complete line of overhead handling equipment, ¼ to 40 ton capacity—contact your Yale distributor listed under "hoists" in the yellow pages of your phone book. Or write for brochure #5145 to The Yale & Towne Manufacturing Co., Yale Materials Handling Division, Dept. AH1-V, Philadelphia 15, Pennsylvania.



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INDUSTRIAL LIFT TRUCKS
TRACTOR SHOVELS • HOISTS

YALE & TOWNE

Yale Materials Handling Division, a division of The Yale & Towne Manufacturing Company. **Manufacturing Plants:** Philadelphia, Pa., San Leandro, Calif., Forrest City, Ark.
Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks • Worksavers • Warehousers • Hand Trucks • Industrial Tractor Shovels • Hand, Air and Electric Hoists

Circle 635 on Page 53

president, and A. K. Kinder, vice president. Mr. Crouch, Mr. Kinder, L. O. Williams, Dorris A. Crouch, and Mark Ertel were re-elected to the board of directors.

Kaiser Aluminum & Chemical Corp. plans to move its general sales offices from Chicago to Oakland, Calif., by Sept. 1. Kaiser plans to retain its present regional and district sales headquarters in Chicago and to maintain an executive office there.

Precision Pattern Co. has been incorporated at 1901 S. 71st St., West Allis 14, Wis., with 1250 shares of no par value. Registered agent is James C. Lewis Sr., same address.

American MonoRail Co., Cleveland, has named four new representatives: American Crane & MonoRail Co., 1850 Hilton Rd., Ferndale 20, Mich., for Michigan; Cook Equipment Co., P. O. Box 1261, South Miami 43, Fla., for Florida; Buffalo Rubber & Supply Inc., 526 Niagara St., Buffalo, for the Buffalo area; and Erie Industrial Supply Co., 1616 W. Eighth St., Erie, Pa., for Erie.

Thor Power Tool Co., Aurora, Ill., has moved its Chicago sales and service branch to the company's Speedway Motor Div. plant at 1834 S. Laramie Ave.

B. R. Dews Foundry Inc., Sullivan, Ill., has been bought by Decatur Foundry Inc. and J. L. Johnson & Sons Inc., both of Decatur, Ill. Dews employs about 15 men and makes cast iron annealing pots.

Roots-Connersville Blower, a division of Dresser Industries Inc., Connersville, Ind., has established a new district sales office at 1619 Ovid St., Houston 10, Tex. Daniel Fulton is manager of the office.

O. L. King & Co., San Francisco, has opened a new 19,000-sq-ft plant and general office at 640 Gilman St., Berkeley, Calif. King & Co. recently began the manufacture of foundry core oil.

Industrial Inspection Supply Co., Burlingame, Calif., and **X-Ray Engineering Corp.**, Gardena, Calif., are offering mobile x-ray inspection to plants which do not operate their own x-ray departments. Portable x-ray units are truck mounted and independently powered.

Marblette Corp., Long Island City, N. Y., has opened a new Chicago office at 5655 W. North Ave. R. S. & W. Industries, Pekin, Ill., is operating in conjunction with the Chicago office.

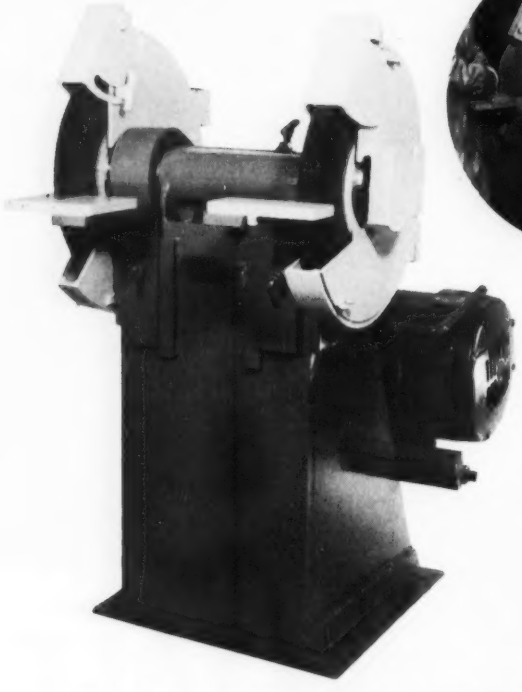
Valley Pipe & Foundry Co. has moved to Blasdell, N. Y., increased its capital stock from $40,000 to $300,000, and changed its corporate name to R. L. Vogel Inc.

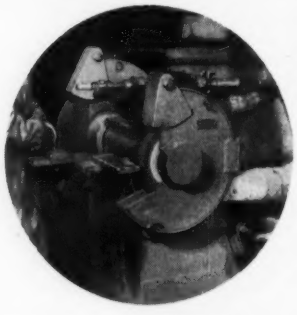
Lewis - Shepard Products Inc., Watertown, Mass., has appointed Hamerslag Equipment Co., 110 Freeway Blvd., South San Francisco, Calif., to be its exclusive sales and service representative in the San Francisco territory.

Eastern Malleable Iron Co., Naugatuck, Conn., has purchased Danforth Anchors, Berkeley, Calif.,

2 in 1 FOX

COMBINATION CUT-OFF and STAND GRINDER





FOX No. 1-16
7½ horsepower
Grinding Wheel
16 x 1½ or 2 x 6
Cut-off wheel
18 x 3/16 x 1
2-speed
V-belt drive

FOX No. 1-20
10 horsepower
Grinding Wheel
20 x 2 or 2½ x 6
Cut-off wheel
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2-speed
V-belt drive

The combination grinder is designed to make available to the foundryman both a grinding wheel and a cut-off wheel on the same machine. This permits trimming, light cutting and also has the ability to grind back in slots and recesses.

FOX GRINDERS, Inc.

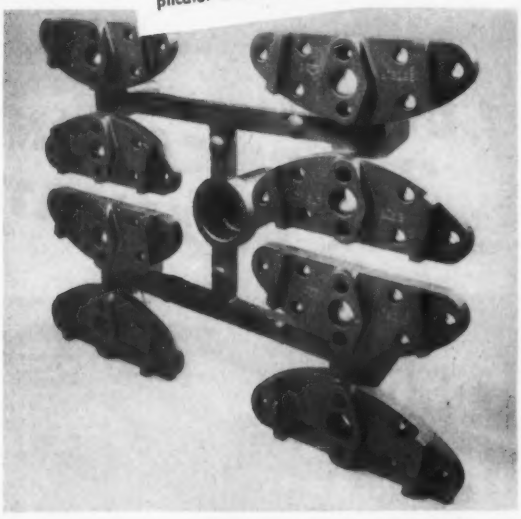
OLIVER BUILDING PITTSBURGH 22, PA.

Circle 636 on Page 53

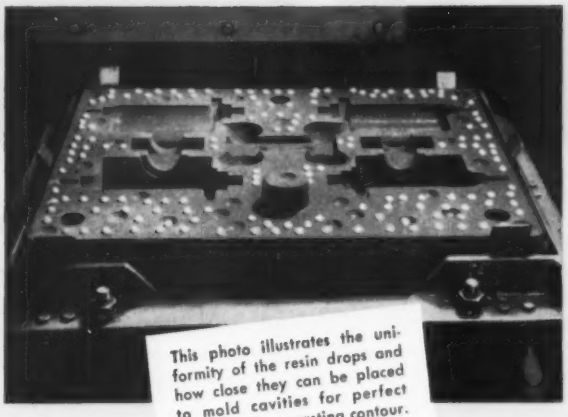
new Shell Bonding Liquid Applicator offers 14 Exclusive Features

This new liquid applicator consisting of a mechanically operated sliding trough over a Plexiglas Template assures uniform dispensing of liquid bonding material. Simple to operate. Maintenance free. Low in cost.

This unretouched photo is proof of the phenomenal results obtained when this new liquid applicator is used to bond shells.



1. Line-to-line contact eliminating finning.
2. Dimensional control across parting line.
3. Elimination of run-out caused by cope lifting.
4. Eliminates drifting of resin into mold.
5. Makes additional bonding area available.
6. Insures accurate placement of bonding material.
7. Allows dropping of bonding material greater distance.
8. Uniformity of drop regardless of length of drop.
9. Automatically keeps bonding liquid in suspension.
10. Sealed dispenser insures clean bonding mix, free of dust and dirt.
11. Rapid change-over from job to job.
12. Transparent bonding template can be used for locating pressure pins in bonder.
13. Additional time available to close mold with use of liquid rather than dry resin.
14. Liquid resin penetrates into mold where dry powder remains on mold surface.



This photo illustrates the uniformity of the resin drops and how close they can be placed to mold cavities for perfect bonding of any casting contour.

Shell Process Liquid Applicator Bonders are available in 15" x 20" and 20" x 30" sizes. Conversion Kits available for Shell Process 15" x 20" Dry Resin Bonders.

Shell Process, Inc. owns full patent rights on the entire bonding process for your protection.

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Manufacturers of Shell Molding Machinery and Allied Equipment

374 Bliss & Parkside, West Springfield, Mass.

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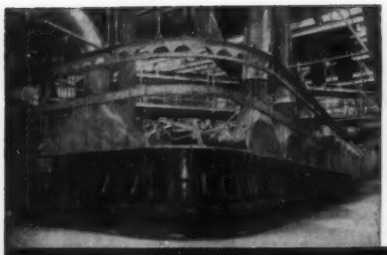

View in new Southern Foundry, shows pouring station with K & B system which removes smoke and fumes as they are formed.

"Shakeouts" in the foundry of a noted implement firm equipped with K & B Dust Control System.

1. DESIGN
2. FABRICATION
3. INSTALLATION

For all three... call K&B

K & B Plenum Chamber Hood for mold conveyor operation. Note bolted section construction for ease of maintenance.

For 50 years, Kirk & Blum has specialized in the DESIGN, FABRICATION and INSTALLATION of efficient, dependable systems for the removal of dust and fumes.

DESIGN: Kirk & Blum engineering specialists survey your plant and then design your system, selecting equipment most suitable for your problem.

CONSTRUCTION: Kirk & Blum fabricates the complete system (equipment excepted), "tailor made" for your installation.

INSTALLATION: The Kirk & Blum contract includes responsibility for the entire system, installed by mechanics with years of specialized experience in the installation of such systems. As a result, you have one undivided responsibility—one complete contract for an installed system, ready to operate.

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DUST AND FUME CONTROL SYSTEMS

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manufacturer of boat anchors. Headquarters of Danforth will be moved to the East, and a warehouse will be maintained at Berkeley. Robert D. Ogg and Waring Carrington will continue as president and sales manager, respectively, of Danforth.

Tamms Industries Co., Chicago, has combined its Raw Material, Foundry, and Flooring units into a single Flooring and Industrial Materials Dept. Object of the action is to improve customer service and distribution of products which do not move through retail channels.

Nopak Div., Galland-Henning Mfg. Co., Milwaukee, has appointed Industrial Air Equipment Co., Indianapolis, its sales representative for central and southern Indiana. Industrial Electric Co., Nashville, Tenn., will serve in a similar capacity in that area.

Carborundum Co., Niagara Falls, N. Y., will build a $\$^3/_4$-million pilot plant for its Research & Development Div. in Niagara Falls. It will be operated by the New Products Branch, R & D Div., headed by Donald G. Sturges.

Eutectic Welding Alloys Corp. has established a new warehouse service center at 167 Brighton Ave., Boston 34, to serve New England under the name Eutectic Welding Alloys—New England Div. Inc.

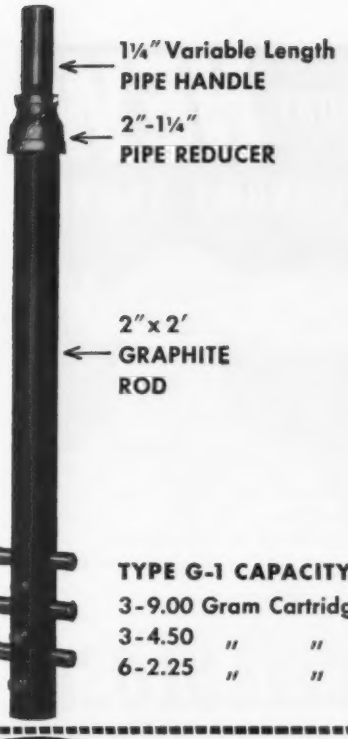
Vanadium Corp. of America, New York, and **Keokuk Electro-Metals Co.,** Keokuk, Iowa, are discussing arrangements for a merger of Keokuk into Vanadium Corp. According to present plans, terms will involve an exchange of stock and will be subject to approval of stockholders of both companies.

Perfect Circle Corp., Hagerstown, Ind., will close its sleeve castings plant at Muskegon, Mich., about Aug. 1. Production of castings will be concentrated at the company's Richmond, Ind., plant.

Duane Specialties Ltd., producer of zinc diecastings, has leased facilities at 2 Johnson St., Newark 5, N. J., which double the space available at the previous location. The company also is purchasing high-

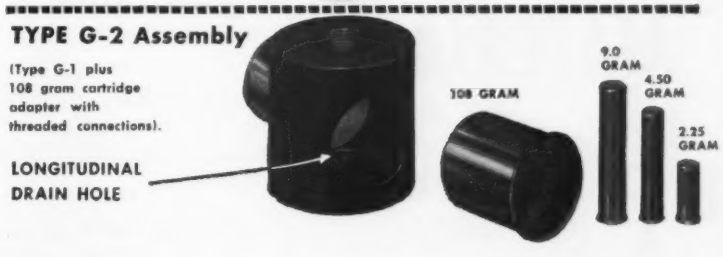
Introducing the LCApplicator...

A CONVENIENT, EFFICIENT AND INEXPENSIVE MEANS OF INOCULATING METAL MELTS WITH LITHIUM COPPER CARTRIDGES



Lithium isn't new to foundrymen. They have long depended on metallic lithium in the handy cartridge form as the best way to remove dissolved oxides and gases from molten copper charges. Now, to more effectively submerge the cartridges to permit dissolving, LCA offers the LCApplicator. Designed in cooperation with experts in foundry practice and graphite manufacturing, the LCApplicator provides a means of introducing lithium copper cartridges within the limits of everyday nonferrous foundry operation.

The LCApplicator has been proven in copper, aluminum and ferrous melts by actual foundry tests. It is constructed of high density, high strength graphite pressure molded at 1550°C. into a strong, tough, machinable rod that is unreactive to molten lithium and commercial metal melts. It will not pollute melts with trace pickup of undesirable elements, nor foul with molten metal. A longitudinal drain hole assures the free escape of lithium and ready drainage of the ports. Two types are available, providing a melt range from 50 to 5,560 lbs. at a single injection rate of .01% of lithium by weight.



LCApplicators ARE FULLY EXPLAINED IN TECHNICAL BULLETIN 310-1258. ADDRESS YOUR LETTERHEAD REQUEST TO OUR TECHNICAL SERVICE DIVISION.

LITHIUM COPPER CARTRIDGES

Lithium Copper Cartridges refine high temperature copper, and brass, bronze and nickel-silver castings. All oxygen is removed, fluidity increased, pouring temperature often lowered, oxide and slag inclusions reduced, grain refined and gas cavities eliminated—*with no change in conventional melting and casting processes.* Four sizes, 2.25, 4.5, 9.0 and 108 grams, offer any combination of weights for introducing any percentage of lithium in the melt. Check these tangible features that mean *real* benefits to foundrymen: (1) thinner walls react with the melt faster (2) compactness that means savings in weight and storage space (3) "Compression-Spin" seal for longer shelf life (4) over 99.9% copper jacket offering the near-ultimate in purity. The end result is a superior casting: sounder, denser, more uniform, more electrically conductive—at less trouble and less cost.

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MAIZE--X

Precisely ground from corn cobs. Provides maximum flowability with uniform hardness — reduces scabs and buckles. Gives superior shakeout with increasing collapsibility.

WOOD--X

100% maple woodflour of uniform texture with controlled moisture content. Gives decreased hot strength at 1000° F. Substantially increases core-gas volume and green compression strength of sand.

Test the exceptional performance of these two products in your own foundry by writing for Free Samples today.

MICHAEL WOOD PRODUCTS INC.

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PRescott 3-8000

Circle 640 on Page 53

pressure equipment of greater capacity and adding several representatives to its sales force.

Jeffrey Mfg. Co., Columbus, Ohio, has moved three of its district offices. The Birmingham office and warehouse now is at 3012 Fourth Ave. South, Birmingham 5; the Philadelphia office at 7 Wynnewood Rd., Wynnewood, Pa.; and the Salt Lake City office at 15-N W. Temple St.

Kaiser Aluminum & Chemical Corp., Oakland, Calif., and **Mexico Refractories Co.**, Mexico, Mo., have agreed on terms of a merger. Subject to ratification by stockholders of both companies, Mexico Refractories will operate as a division of Kaiser Aluminum in conjunction with the Kaiser Chemicals Div.

Machinery & Equipment Sales Inc., 1012 Cathedral St., Baltimore, will represent American Air Filter Co., Louisville, in the Baltimore area.

Fleming Foundry Co., Springfield, Mass., has been bought by Jacob Radding, Valley Mfg. Co., also of Springfield.

A. P. Green Fire Brick Co., Mexico, Mo., has acquired Climax Fire Brick Co., Climax, Pa., by an exchange of common stock. Climax's principal products are Pennsylvania-type fire clay refractories.

Memphis Aluminum Foundry Inc., Memphis, Mo., established recently to make sand and permanent mold aluminum castings, now is in production. Clarence S. Phillips is president and Phillip Payne vice president.

Biever Air & Hydraulic Equipment, 254 E. Pacef Ferry Rd. N.E., Atlanta 5, Ga., has been appointed representative for Hunt air and hydraulic control valves in the Atlanta territory.

Superflux Mfg. Co., Allen Park, Mich., has licensed Scott Briquetted Products, Welland, Ont., Canada, to be sole manufacturer of Superflux and Ladle Flux in Canada. Sales in Canada will continue to be handled by the Foundry Supply Div., Canadian Hanson & Van Winkle Co., Toronto.

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Match Plates
Cope & Drag Plates
Core Box Castings
White Metal and
Aluminum Pattern
Castings
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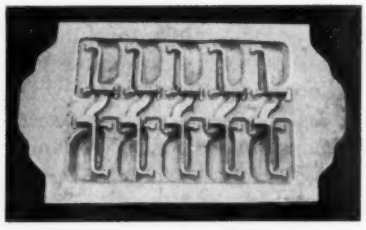

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MIDWEST PRESSURE CASTING CO., INC.

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Circle 641 on Page 53

Circle 639 on Page 53

404 hours of sandblasting

Only 1/32 of an inch change in this nozzle diameter!

Hundreds of hours of useful life remain in the Norton NORBIDE Pressure Blast Nozzle shown in use here. Matter of fact, its *guaranteed minimum service life* with silica sand is 750 hours . . . with steel shot or grit 1500 hours! And this means that it will maintain a concentrated stream contour and high efficiency abrasive velocity *throughout* its life span.

And it's typical of NORBIDE* Pressure Blast Nozzles

The reason that NORBIDE Nozzles perform *efficiently* up to 200 times longer than cast iron nozzles is simple. They're lined with light, tough Norton Boron Carbide — the compound that's only exceeded in hardness by the diamond. It's today's hardest man-made, molded material with an almost unbelievable resistance to wear.

NORBIDE nozzles sharply reduce — by 10% to 20% — the wasteful consumption of compressed air . . . all too frequently neglected in considering the overall cost of pressure blasting.

You can clean all sizes of castings, faster and more economically with Norton NORBIDE Pressure Blast Nozzles. They're available with bores from 1/8" to 7/8"; lengths up to 6". For complete details write NORTON COMPANY, Refractories Division, 304 New Bond Street, Worcester 6, Massachusetts.

NORTON PRODUCTS Abrasives
Grinding Wheels • Grinding Machines
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REFRACTORIES
Engineered . . . Rx . . . Prescribed

Making better products . . . to make your products better

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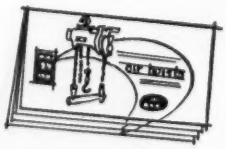
new
LIGHT weight
LOW-HEAD
AIR HOISTS

Unequalled for tough jobs, these hoists are unaffected by hot, corrosive, or wet atmospheres and are explosion and shock proof.

They are available in two capacities. The ½-ton size weighs only 39 lbs., and the 1-ton size weighs only 55 lbs. Fully-loaded lifting speeds are 40 fpm and 20 fpm respectively, and both units are available with either link or roller chain.

Ask your Ingersoll-Rand AIR-engineer to demonstrate these new "light weight leaders" in the complete line of Ingersoll-Rand air hoists from 200 lbs. to 24,000 lbs. capacity. Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Send for free copy of new Lightweight Air Hoist Bulletin Form 5224.



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Tools plus AIRengineering increase output per man

8-752

Magnethermic and Ajax Merge, Form Ajax Magnethermic Corp.

Merger of Magnethermic Corp., Youngstown, Ohio, with Ajax Electrothermic Corp. and Ajax Engineering Corp., Trenton, N. J., has been concluded, subject to approval of stockholders. The merger will create a new firm, Ajax Magnethermic Corp., with headquarters in Youngstown, which will be a fully integrated manufacturer of high and low frequency induction heating and melting equipment.

Magnethermic is a producer of high and low frequency heating equipment, whereas Ajax Electrothermic makes high-frequency melting units and Ajax Engineering concentrates on low-frequency melting furnaces. Anticipated annual sales of the new firm will be about $9 million. A large, decentralized field service organization will be developed to improve service over a larger geographical area.

John A. Logan, Magnethermic president, will head the new company. The board of directors will be expanded to include Guillam H. Clamer, president of Electrothermic and chairman of Engineering.

Book Review

Spectrochemical Analysis for Trace Elements, **hard cover, 84 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $2.75.**

Growing interest in trace analysis led to the arrangement of a symposium on the application of emission spectroscopy at the 1957 annual meeting of ASTM, and this volume contains six papers and discussion presented at that time.

Papers include: "Emission Spectrometric Determination of Oxygen in Metals" by V. A. Fassel, W. A. Gordon, and R. W. Tabeling; "Spectrographic Determination of Trace Elements in Metals" by J. A. Norris; "Trace Analysis by Means of Graphite Spark" by J. M. Norris and F. X. Pink; "Principles of Quantitative Biological Emission Spectrography" by B. L. Vallee, "Application of Emission Spectrography to Trace Elements in Plant and Soil Samples" by W. G. Schrenk, and "Spectochemical Analysis of Trace Elements in Geological Materials" by K. J. Murata.

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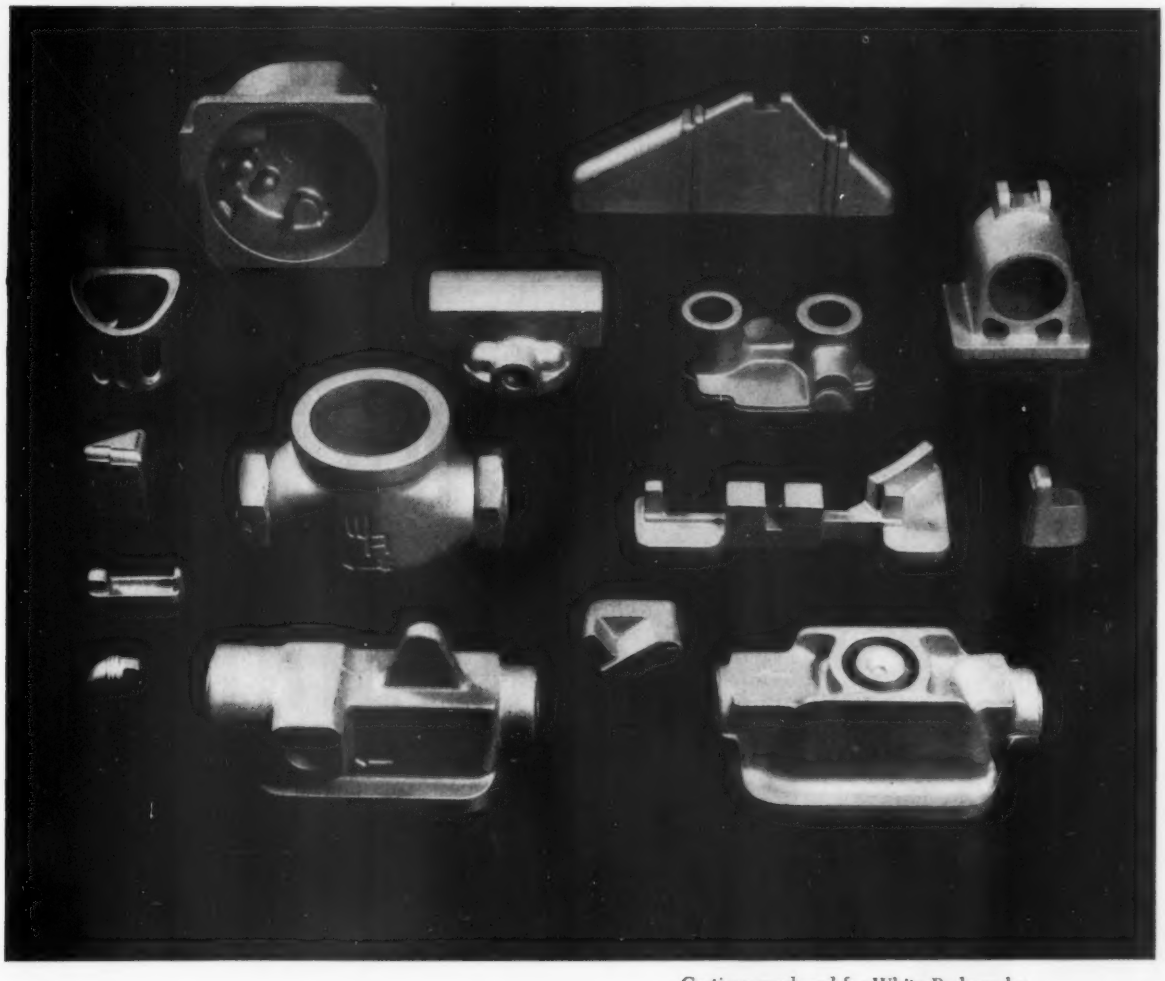

Castings produced for White-Rodgers by
Hutchinson Foundry Products Inc., Alton, Ill.

For cost-cutting castings

Pick a BAKELITE Shell Molding Resin!

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The fine details, smooth finish, and close tolerances of the castings above are the result of shell molding with BAKELITE Brand Phenolic Resins.

These resins are produced by Union Carbide Plastics Company specifically for the shell molding process. Their variety permits you to select the formulation that is best fitted to your own particular requirements.

In addition, you can call on the experience and technical assistance provided by the Union Carbide Plastics Company, pioneer in the manufacture of shell molding resins in this country. For further information on resins for shell molds and cores, write Dept. DF-O1E, Union Carbide Plastics Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y. *In Canada:* Carbide Chemicals Company, Division of Union Carbide Canada Limited, Toronto 7.

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Circle 644 on Page 53

Serviceability of a part depends mainly on its ability to withstand sudden and repeated loads. Stress concentration affects this ability adversely. Since proper design minimizes stress concentration, design elements are discussed. This article is the first of two on dynamic loading

DYNAMIC LOADING

. . . Its Effect on Casting Design

By JOHN B. CAINE
Foundry Consultant
Cincinnati

Fig. 1—Light transmission of plastic hooks varies with internal stress and strain developed by a load. Frequency of the dark bands shows extent of stress concentration

● IN A PREVIOUS article[1] the subject of streamlined cast design was discussed from the standpoint of static loading. The static phase of load-carrying ability must be discussed first as the simpler phase, just as statics is studied first in a course on mechanics, followed by dynamics.

In most service loading, especially when so-called ductile metals are used, dynamic loading is the important loading for two reasons. First, in many engineering applications involving ductile metals the load is applied suddenly, or applied and removed many times during the life of the part. It should be emphasized that dynamic loading is not restricted to loads applied suddenly, although this is one phase of dynamic loading. A more important phase has to do with loads applied and removed rapidly without impact. For example, a shaft revolving in a bearing is subjected to rapid dynamic loading. With each revolution the metal at the surface of the shaft is subjected to maximum tension, through neutral to maximum compression.

Vibration has caused fatigue failure in many instances. One case of fatigue failure familiar to many foundrymen is due only to vibration. It occurs in the handle of the widely used laboratory sand rammer. Another example, involv-

ing severe stress as well as vibration, is fatigue failure of the eccentric shafts of shakeout machines.

Fatigue Failures Are Common—If the metal is overloaded in fatigue, it fails at loads lower than expected from its tensile properties. Fracture in fatigue shows no deformation regardless of tensile ductility. This type of fracture accounts for the vast majority of service failures. A similar type of fracture, notch brittle fracture under loads applied suddenly, also showing no deformation, accounts for practically all the remaining service failures of metals. This is true for all metals regardless of how formed.

Therefore, tensile properties, even yield strength, become relatively minor factors in load-carrying ability of ductile metals. Fatigue strength and resistance to notch brittle fracture become major factors, with the accent on fatigue strength. Stress concentration is the major factor influencing both fatigue strength and notch brittle fracture. Because the shape of the part (the design) is a major factor controlling stress concentration, design becomes a major factor in load-carrying ability, over and above its influence on imposed load, as was discussed in the previous article.

An attempt was made in the previous article[1] to show how shape (design) drastically changes the load, measured in pounds per square inch, imposed on the part. The imposed load can be applied statically, suddenly, or repeatedly. The equations of the last article do not distinguish between these three types of loading. This article will attempt to show how the calculated applied load is increased in local areas due to stress concentration. It must be emphasized that the increase in applied load due to stress concentration is not minor, but in the order of 50 to 100 per cent in many instances.

If a part made of a ductile metal is loaded statically under conditions of stress concentration to a point above its tensile strength, fracture does not necessarily occur. If the metal is capable of just slight deformation, equal to 4 to 5 per cent tensile elongation, it can deform enough in these local areas to decrease stress concentration automatically. Then, too, the tensile strength of ductile metals is increased in the areas of high stress concentration, as discussed in a preceding article.[2] Such local deformation and strengthening cannot occur in fatigue. If the fiber stress at any location exceeds the fatigue strength, even after millions of load applications, a crack will form and will propagate to fracture of the part or section. Failure is a matter of number of load applications and time.

Gray Iron Is Different—A different set of conditions applies to gray iron. Gray iron is relatively insensitive to fatigue in areas of stress concentration. However, gray iron can not deform plastically in areas of high stress to distribute a static load more evenly. If the average load throughout the highly stressed section exceeds the tensile strength of the iron, the section will break. At the same time, gray iron has appreciable elastic deformation. If the part is streamlined so that the over-all load is distributed evenly over an appreciable length, the same over-all load that caused rupture when concentrated can now be handled easily. Under these specific conditions streamlining can actually change gray iron from a so-called brittle material to a ductile material. Therefore, stress concentration as discussed in this article is important in gray iron design even for static loading.

The role of stress concentration in service failures has been recognized but not appreciated for the last 80 years. Only in the last 20 years has the measurement of stress concentration become a science. Fundamental work has been done by photoelastic methods or by pure mathematics. No metal is involved in either method. Photoelastic studies are conducted on models made of a transparent plastic whose light transmission varies with internal stress and strain. Fig. 1 shows an example. The stress distribution can be determined by the light and dark bands, and stress can be determined quantitatively, within limits, by the frequency of the dark bands in any area.

Photoelastic studies can be extended to metal parts by brittle lacquer techniques. Because deformation (strain) is proportional to stress for most metals (gray iron is an exception), and brittle lacquers crack when deformed just a few millionths of an inch, the crack patterns of brittle lacquer are similar to the light fringe patterns of plas-

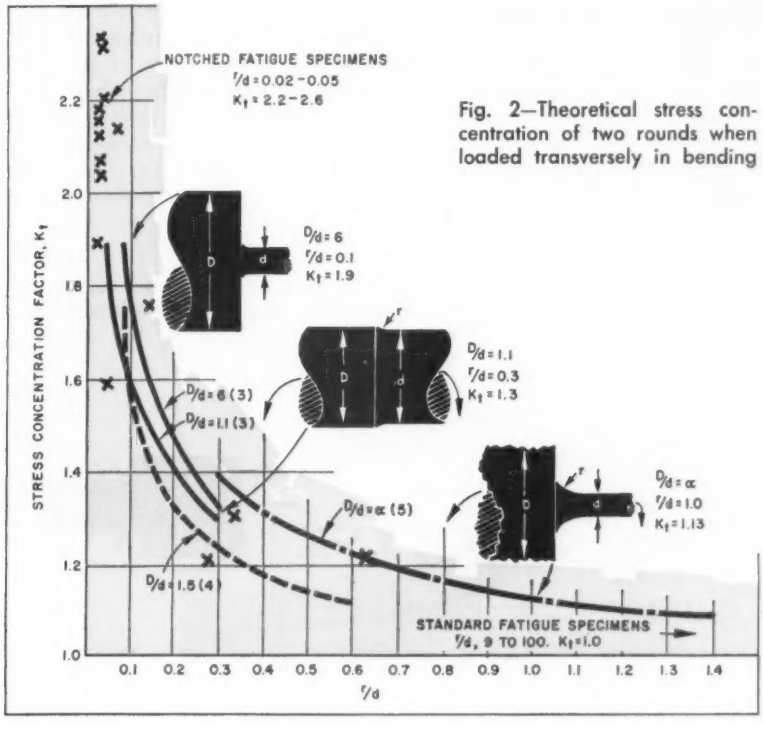


Fig. 2—Theoretical stress concentration of two rounds when loaded transversely in bending

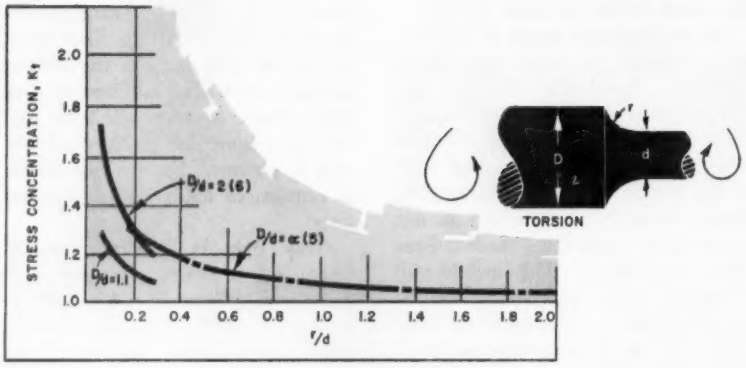


Fig. 3—Theoretical stress concentration of a junction of two rounds loaded in torsion. Numbers in parentheses are literature references

tic models. Stress at any given area can be calculated from the amount of strain. Strain gages can be used for more accurate measurement if desired.

This work can be boiled down to a series of charts like Fig. 2, showing stress concentration for any shape under any type of load. Fig. 2 shows stress concentration values determined mathematically and photoelastically for a junction of two rounds of different diameters and fillet radiuses when loaded transversely in bending. Three scale drawings are shown as illustrations. It is evident from Fig. 2 that the fillet radius is a more important factor in stress concentration than the differences in diameter of the two sections.

Casting Process Is Best—Here is where the casting process excels No other forming process can form the large radiuses necessary to minimize stress concentration with the efficiency of casting. The advantage in load-carrying ability is by no means minor. The difference in theoretical stress concentration (K_t) due to increasing the fillet radius of a 1-in.-diam smaller round from 0.1 in. to 1.0 in. is 1.90 to 1.13. This difference is equal to an increase in load-carrying ability, particularly in fatigue, of 68 per cent. This is equivalent to increasing the fatigue strength of steel from 28,000 psi to 47,000 psi. Such an increase in fatigue strength requires an increase in tensile strength, at 40 per cent endurance ratio, from 70,000 psi to 118,000 psi.

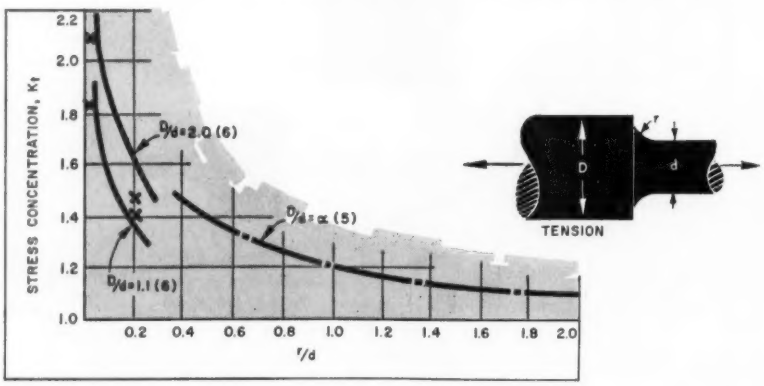
Things are not as simple as this, however. The curves of Fig. 2 show the theoretical stress concentration and measure the stress imposed at the point of stress concentration. Actual failure also must take into account the metal's susceptibility to this stress concentration. Things get complicated fast now, for the different metals and even the same metal react differently depending on a host of variables. The shape and loading data in Fig. 2 correspond to that of the standard fatigue specimen. A direct correlation can be made between the theoretical stress concentration (K_t) of Fig. 2 and the metal's reaction to this stress concentration K_f. K_f is the ratio between the strength of a notched fatigue specimen and an unnotched fatigue specimen with a very large radius and a polished surface so that its theoretical stress concentration (K_t) equals 1.0.

The crosses in Fig. 2 show some K_f points that have been cited to substantiate the theoretical stress concentration values. However, this is not the whole picture. All the x points are for steel heat treated to tensile strengths exceeding 100,000 psi. A more thorough survey of the literature uncovers many more fatigue tests of sharply notched steel specimens with K_f values from 2.0 to 2.3 that gave K_f values as low as 1.3. It is significant that most, but not all, of these specimens were made from relatively soft, low-strength steels.

A further survey of the literature discloses that metals other than steel show K_f values approaching the theoretical K_t values at strengths usually used in design. Stress concentration susceptibility of the various metals quickly leads the reader into a sort of never-never land somewhere in between advanced mechanics and advanced metallurgy. If streamlined cast design is accepted, it is possible to bypass this complex subject with a few words in the majority of designs encountered.

Streamlining Important — If streamlined cast design, involving for the most part radiuses at junctions of sections equal to or exceeding the section thickness, is used, maximum stress concentration is decreased to not over 1.2. The whole problem of the metal's susceptibility is bypassed except in special instances. Streamlining as a simplification will become increasingly important in the design of parts for civilian, ground-borne use. The long-term trend in such design is to use metals of gradually increasing tensile strength. The softer metals now used are relatively in-

Fig. 4—Theoretical stress concentration of a junction of two rounds loaded in tension. Numbers in parentheses are literature references



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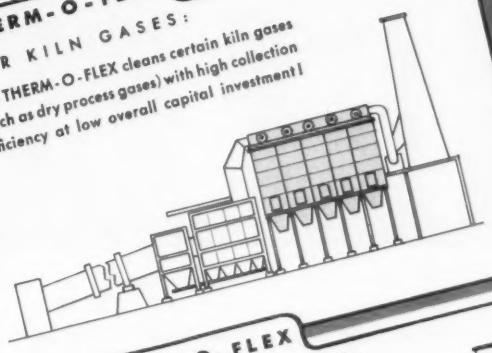

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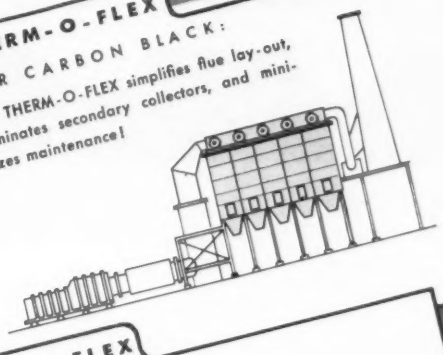

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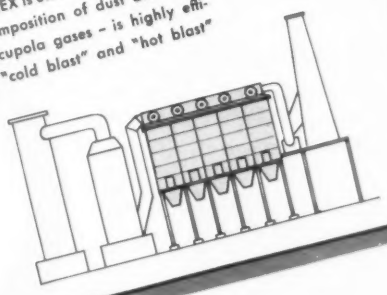

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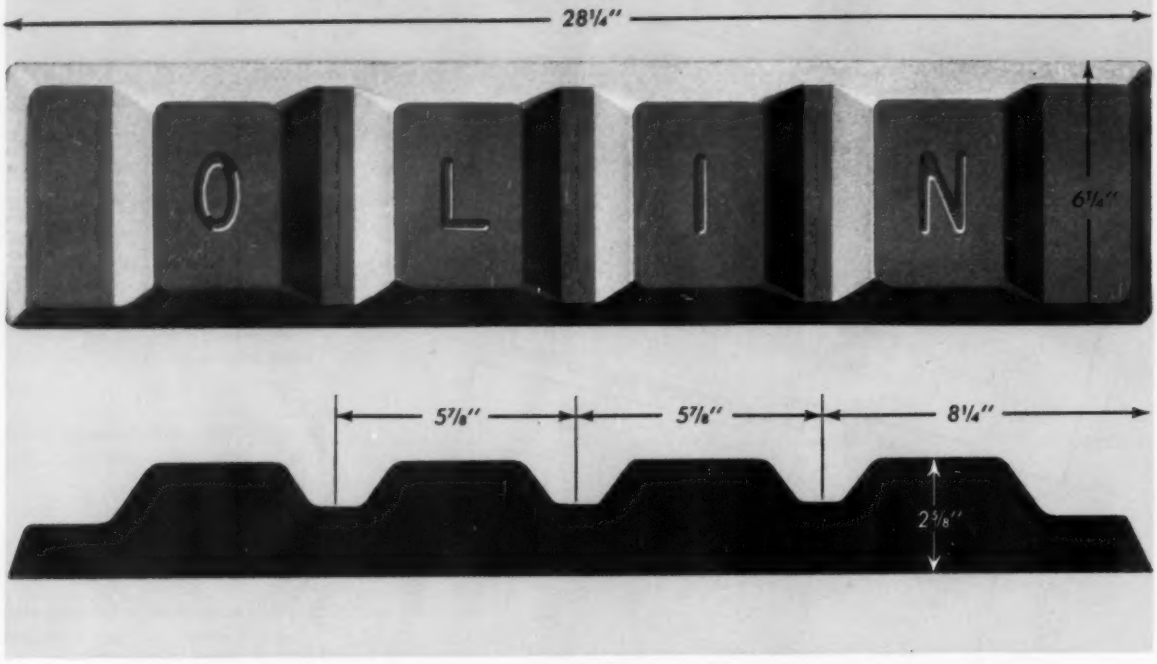

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sensitive to stress concentration in fatigue.

What may seem a small increase in tensile strength may increase susceptibility to stress concentration much more than would be expected. The result is that the fatigue strength of the part may be increased very little. The designer has two choices. He either can streamline to keep stress concentration at a minimum, or become involved in the complex problem of fatigue-tensile strength ratios as influenced by hardness, microstructure, type of metal, surface, type of loading, and other variables.

There is another important facet of streamlining to bypass the problem of notch sensitivity in fatigue. The determination of notch sensitivity involves fatigue testing, about the most costly type of testing. Data on maximum stress concentration are either in the literature, or can be determined rather easily for any given shape by brittle lacquer technique. If the part is streamlined, maximum stress concentration should be under 1.2 and this value can be used at its full value without danger of greatly overdesigning. Perhaps the actual value (K_t) as determined by elaborate fatigue tests is 1.1. The difference, less than 10 per cent, is lost in normally used factors of safety.

This point becomes increasingly important when the simple junctions of this article are assembled into usable castings. The shape quickly becomes too complicated to be evaluated theoretically, and testing becomes imperative if the design is to be precise. Testing for points of stress concentration by brittle lacquer is relatively simple. However, such testing tells only the maximum stress concentration. If these maximum values are low they can be incorporated into the design without undue sacrifice. If they are high and the metal's susceptibility to the particular stress pattern is required, fatigue testing usually is prohibitively expensive unless hundreds of thousands of parts are involved.

Some Parts Differ—For certain parts, many having a junction of rounds as in Fig. 2, large radiuses cannot be used. Shafts and spindles are examples. Many of these parts require a small fillet to fit a bearing. If small fillet radiuses must be used, some method of increasing the fatigue strength of these areas is necessary unless the part is overdesigned. Usually it is futile to increase the strength and hardness of the part as a whole.

Sensitivity to stress concentration increases with hardness with most metals and fatigue strength is increased very little. The most practical method of solving this problem does not involve metallurgy or design. It is done by inducing compressive stress in the surface. Any working load must overcome the compressive stress first before the metal is stressed in tension. This can be done by coining, rolling, shot peening, flame hardening, or carburizing. This is another subject, so foreign to the one under discussion that it must be deferred to another article.

Accepting for the moment the thesis of low stress concentration, Fig. 3 and 4 show the theoretical stress concentration (K_t) for the same shape as Fig. 2, but loaded in tension and torsion. The K_t values can be accepted as maximum values. The metal's response in fatigue may be lower, depending on any number of other factors. However, if the K_t value is low to start with, it is of little importance how much lower the K_t value is. Fig. 3 and 4 are similar to Fig. 2 in that K_t decreases rapidly to a value between 1.1 and 1.2 at fillet radiuses equal to the section thickness or width. The decrease in K_t is small past this point. At r/d = 1.0 the over-all load is increased only 10 to 20 per cent for this shape, regardless of how it is loaded.

The junction of two rounds, or a round to a flat, is quite common in

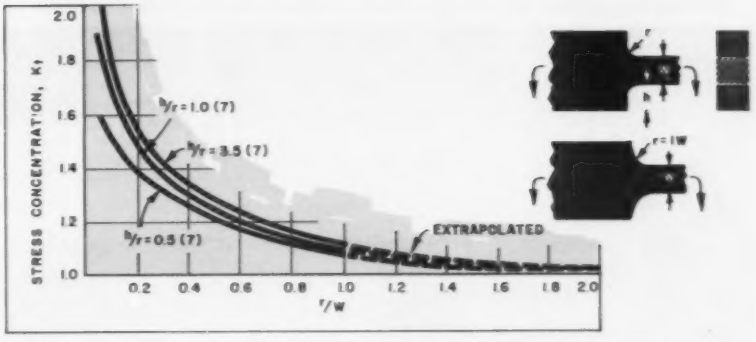
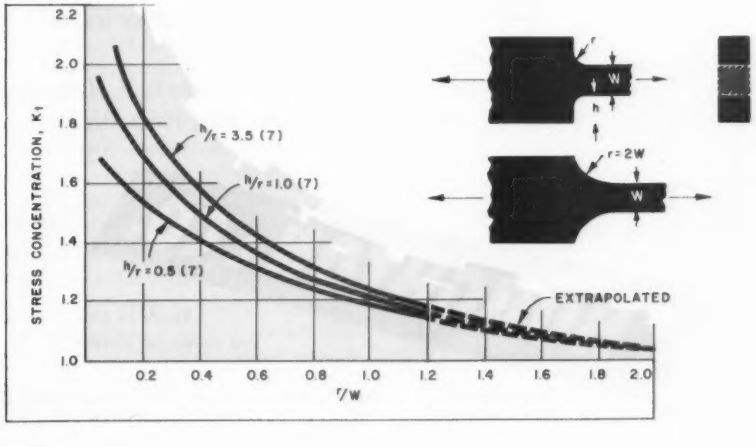


Fig. 6—Theoretical stress concentration of a junction of two flats loaded in tension. Numbers in parentheses are literature references

Fig. 5—Theoretical stress concentration of a junction of two flats loaded in bending. Numbers in parentheses are literature references



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castings. A radius equal to the diameter of the smaller round to eliminate most of the stress concentration is easily cast and will serve in most instances. If bearings are involved, mating sleeve bearings with equally large radiuses are possible. Adapter sleeves can be used to position ball and roller bearings away from the fillets. Such adapter sleeves will handle appreciable side thrust. If bearings must contact the thrust faces, some method should be used to strengthen the junction. Inducing compressive stress as discussed previously is the best and about the only solution.

Square Sections Are Similar—Similar factors of stress concentration (K_t) are found when rectangular or square sections are joined as shown in Fig. 5 and 6. Fig. 6 shows one of the few instances where the fillet radius must be over 1t (in this case the width of the section) to obtain stress concentration under 1.2.

Fig. 7 summarizes the K_t values for an "L" junction like Fig. 7a and 7b in tension and torsion. The difference in K_t values for the different loadings is interesting. Stress concentration in the particular shape of Fig. 7a and 7b is appreciably higher when the junction is stressed in torsion than when stressed in tension. It is perhaps significant that when the "L" junction as a whole is stressed in tension, the outer sharp corner is in compression and the load carrying ability of the junction in fatigue is controlled by the fillet radius. With this loading condition stress concentration falls sharply with increasing fillet radius to 1.2 K_t at $r/t = 1.0$ and there is little decrease in stress concentration with larger fillet radiuses.

The corresponding point in torsion is $K_t = 1.5$. A possible reason for this increase is that the sharp outer corner of Fig. 7b is in torsion and is contributing to the over-all stress concentration of the "L" junction. A possible solution that is easily cast is the streamlined 1t-2t "L" junction of Fig. 7c. This streamlining should increase load-carrying ability in fatigue, but decreases moment of inertia and section modulus. Table I shows that although the 1t-2t rounded corner does decrease static design properties, if the metal of the corner is added to the outer leg, only section modulus is significantly lower than for the square corner. This decrease in section modulus can be compensated by slightly higher yield strength.

TABLE I—Effect of Corner Shape on Static Design Properties

"L" Section	Area, Weight	Moment of Inertia	Section Modulus	Radius of Gyration
Square corner	100	100	100	100
1t-2t round corner	93%	87%	71%	92%
1t-2t round corner with metal of corner added to outer leg	100%	99%	79%	99%

Some unpublished fatigue studies of cast "L" junctions have shown that the 1t-2t rounded corner is 98 per cent as strong in fatigue as the square corner when stressed in tension.[22] Fig. 7 indicates that if the corner had been tested in torsion, the fatigue strength of the 1t-2t rounded corner would be higher than the square corner.

Fig. 8 shows that the same relations between fillet radiuses and stress concentration of an "L" junction hold when this junction is used to make a more complicated shape, a hollow tube. The relations of Fig. 8 show, if anything, that the tube is more sensitive to sharp fillet radiuses than the single "L" junction. Although not formally studied, the tubular design shown by Fig. 8c, with 1t-2t radius corners, should impose even less stress concentration than the tube with square outer corners. At the same time it is more castable.[13]

A similar relation between stress concentration and fillet radius exists for the "T" junction. Stress concentration decreases, as shown in Fig. 9, to about, or under 1.2 with a fillet radius of 1t. It therefore seems possible to make a general rule that fillet radiuses equal to the thickness of the section, or the smaller of two unequal sections (1t), will insure stress concentration values not exceeding 1.2. This by no means rules out larger radiuses, especially when used to join

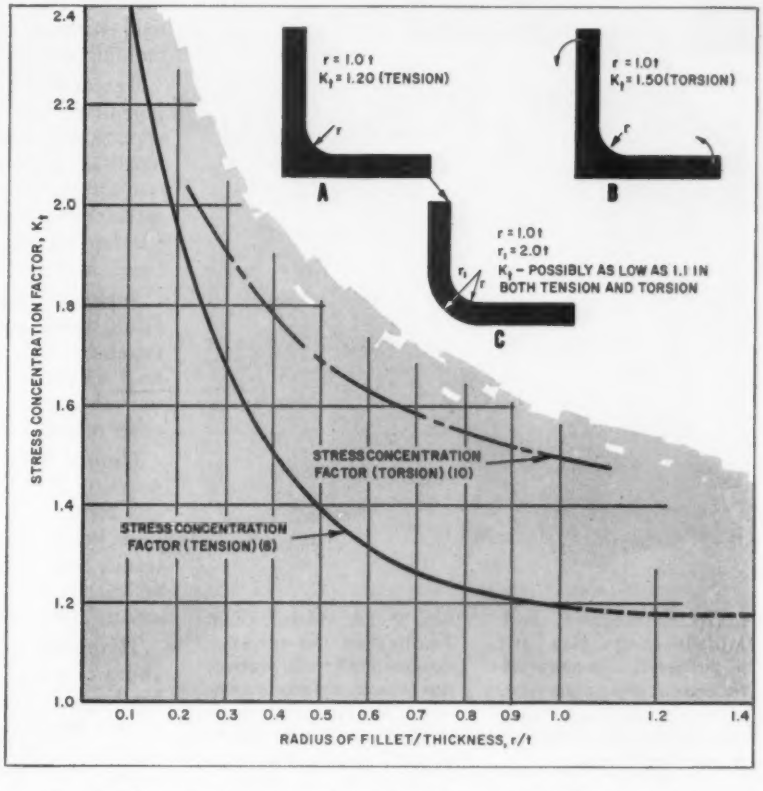
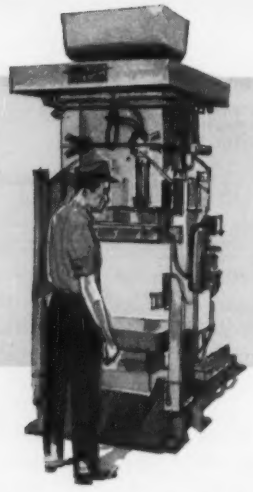


Fig. 7—Theoretical stress concentration of an "L" junction loaded in tension and torsion. Numbers in parentheses are literature references



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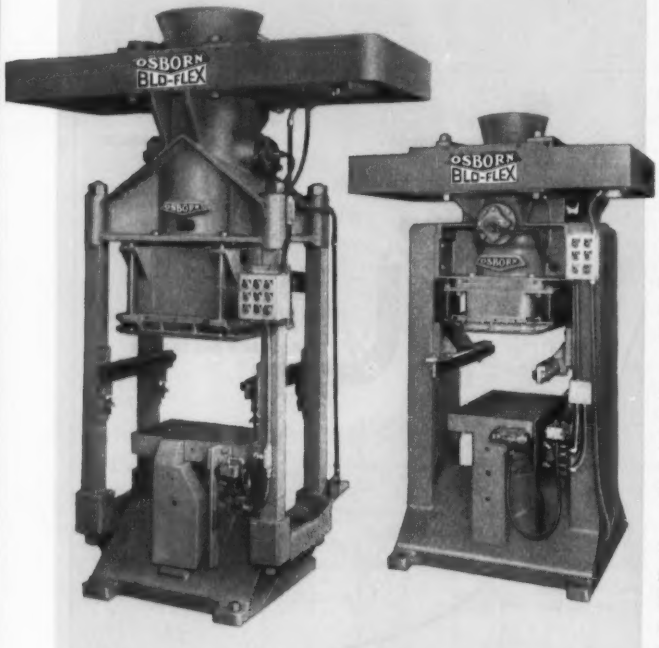

BLO-FLEX Model 19-M-2 Middle-range size unit in the series—engineered to produce medium-size molds. All BLO-FLEX models operate automatically, on preset time cycles.

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opening and spreader which are integral with the squeeze head. With one vertical acting piston, the mold is blown and squeezed to the desired degree of hardness. As the vertical clamp piston descends to the rest position, the mold is stripped.

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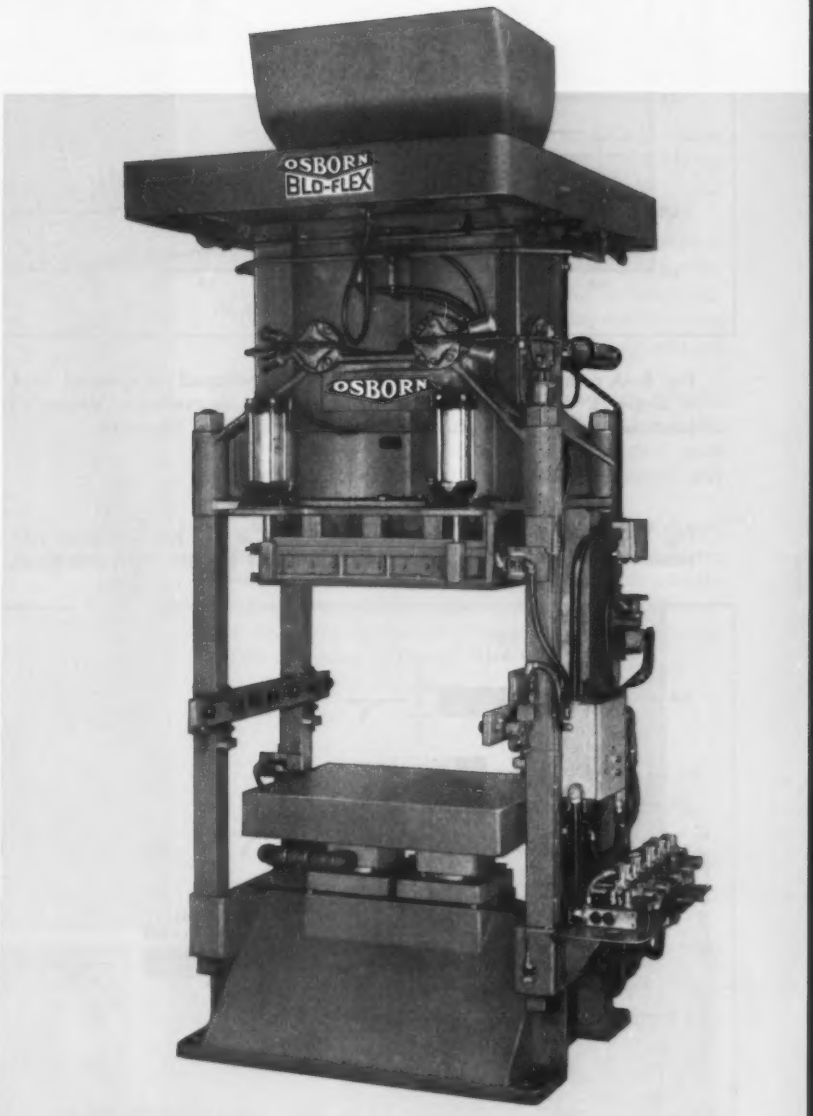
- **No Sand Spillage** because of blow-type fill. Exact, controlled volume of sand is blown and squeezed immediately—resulting in clean operation.
- **Controlled Fill** considerably increases the efficiency and useable capacity of the sand system.
- **Rapid Cycle Time** . . . mold production cycle is completed within 12 seconds.
- **Minimum of Working Parts** helps keep maintenance at an extremely low level. No shuttling, no indexing. Only major working parts are cut-off plate in the blow head and vertical piston.
- **No Costly Foundations** are required with the BLO-FLEX machine. Support is necessary for only the machine itself.
- **Compact Construction** means the BLO-FLEX requires only a minimum of floor area for operation.



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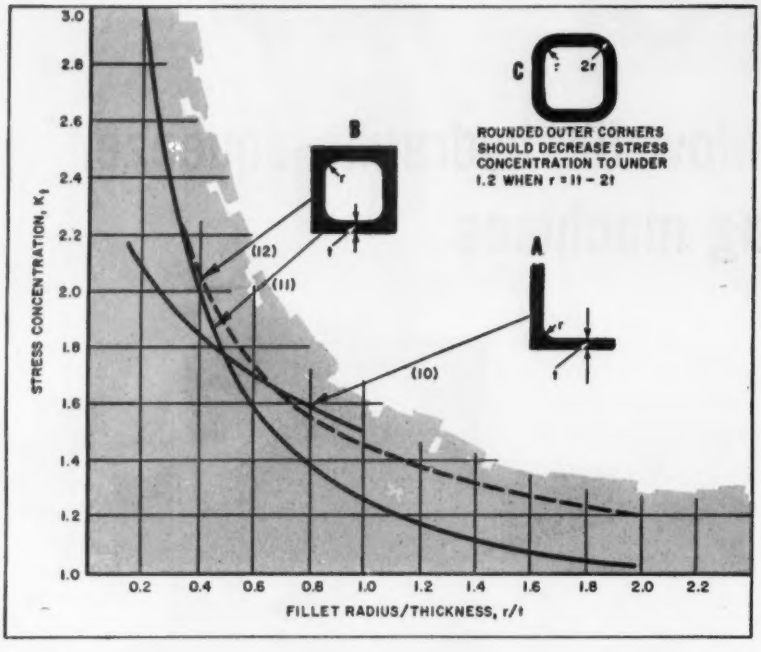
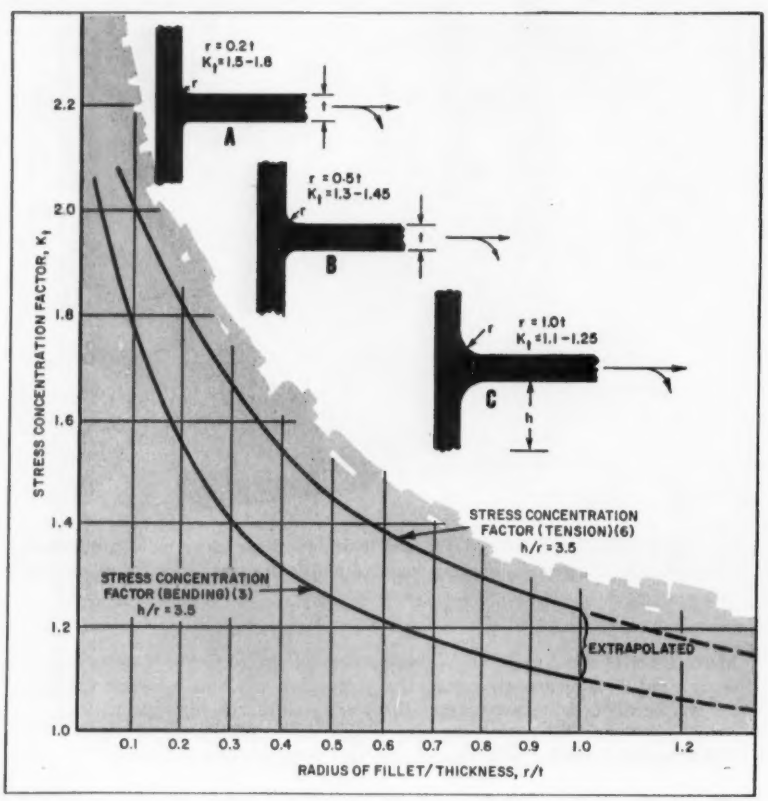


Fig. 8—A comparison of stress concentration developed by torsional load in single "L" junctions with tubular shapes made by combining single "L" junctions. Numbers in parentheses are references to literature

Fig. 9—The theoretical stress concentration of a "T" junction loaded in tension and bending. Numbers in parentheses are literature references



various sections together. The larger the radius the better. The only limitations as far as cast design is concerned are decreased moment of inertia, section modulus and interference with appendages, or working functions.

Radiuses of 2t to 10t can and should be used to join the simple sections discussed in this article into actual castings. These sweeping curves not only insure against unexpected stress concentration, but also make a better looking finished part.

(To be concluded)

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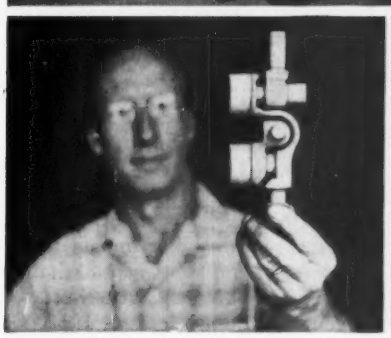


Top This For Complexity! Few cores can surpass the complex design of this one, held by core room foreman Arthur King. Like all others, it is made with Cities Service Delco 58 Core Oil.

Grandma Never Baked Like This! . . . but Grandma couldn't have taken greater pains than they do at Brass Foundry Company. One great asset is the fast-bake qualities of Cities Service Delco Core Oil.

1,600,000 Pounds Of Brass And Aluminum Castings are poured each year at Brass Foundry Co. They are made to the demanding specifications of the electrical, agricultural, aviation, and auto industries.

Foundry Developments

By EDWIN BREMER
Metallurgical Editor

Gives Hefty Wallop

EFFECTIVE work-hardening of high-manganese austenitic steel castings such as railroad switch frogs and cross overs, dipper bucket teeth, etc., is being accomplished by explosive impact. Material and procedure developed by DuPont involve use of explosive material in sheet form which is fastened by an adhesive to the area to be hardened and then detonated.

The explosive is pentaerythritol tetranitrate (PETN) combined with other materials to form tough, flexible sheets measuring 10 x 20 in. and about 5/64 to 21/64 in. thick. Depth of work hardening is controlled by the thickness of the sheet material.

Several sheets of thin material may be bonded together with adhesive to provide the same impact effect as a comparable heavier sheet. Sheets may be cut with a fixed blade knife such as a linoleum knife on a nonsparking surface to any desired shape to cover a specified area. The sheet explosive also may be used to cut or break metal or other materials.

Resonance Is Cue

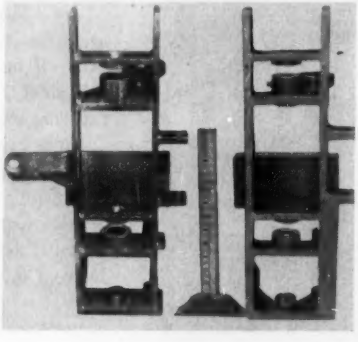
UTILIZING the principle of ultrasonic resonance, General Motors Development Staff has designed a gage that simplifies measuring thousandths of an inch variations in wall thickness of automotive cylinder blocks. The device also may be adapted to measure thickness of straight and curved surfaces of various metals and alloys, glass, and most solid plastics.

In operation, a probing crystal is vibrated against the inside cylinder wall surface, sweeping as high as 4 million cycles per second until at some frequency point the surface is vibrating in harmony or resonance with the crystal. This resonance varies with the wall thickness. Resonance frequency is translated to a 14-in. oscilloscope tube containing an 11-in. scale calibrated for thickness variations as low as 0.001 in.

Cylinder wall thickness is indicated by a single vertical step in a bright horizontal line instead of by two or more vertical "pips." When cylinder wall thickness is too thin a red low-limit light flashes on.

Brings Home the Bacon

SINGLE malleable iron casting which replaces a 23-part weldment and reduces cost by two-thirds is shown at the right in the accompanying illustration. It is a frame for a powered track drill. The former method of fabrication presented a problem in maintaining tolerances. With the assistance of a malleable foundry, the frame was converted to a single casting which is stronger as well as better looking. Naturally, tolerance no longer is a problem.



Heat-Resistant Alloys

AN INVESTIGATION has been made to improve mechanical properties of heat-resistant alloys at elevated temperatures by varied melting and investment casting practices. Two cobalt-base and two nickel-base alloys were tested to determine effect on gas content, tensile properties at room and elevated temperatures, stress-rupture properties, and oxidation resistance. Resultant data failed to support general conclusions applicable to the four alloys.

Details are available in "Studies and Comparisons of the Properties of High Temperature Alloys Melted and Precision Cast Both in Air and in Vacuum" by M. J. Stutzman. It may be obtained from the Office of Technical Services, Department of Commerce, Washington 25, for $2.50.

Register a First

METALLURGISTS of the Bureau of Mines, Albany, Oreg., have succeeded in making the first casting of molybdenum. It is a hollow cylinder about 4½ in. in diam, 8 in. long with a 1-in. wall. In making the casting the consumable electrode process in combination with vacuum melting and pouring was employed. Molten molybdenum from the arc of the electrode was received in a water-cooled copper crucible. From the crucible molten metal was conducted by a series of troughs into a spinning graphite mold to form the hollow cylinder.

Boost for Green Sand

IMPROVEMENTS in green sand molding technology by Central Foundry Div., General Motors Corp., Danville, Ill., have made it possible to mass-produce successfully cast automotive crankshafts with lower cost molding materials. Crankshafts used in Pontiac passenger car engines are made of a special type of ArmaSteel, a pearlitic malleable iron modified by alloy additions.

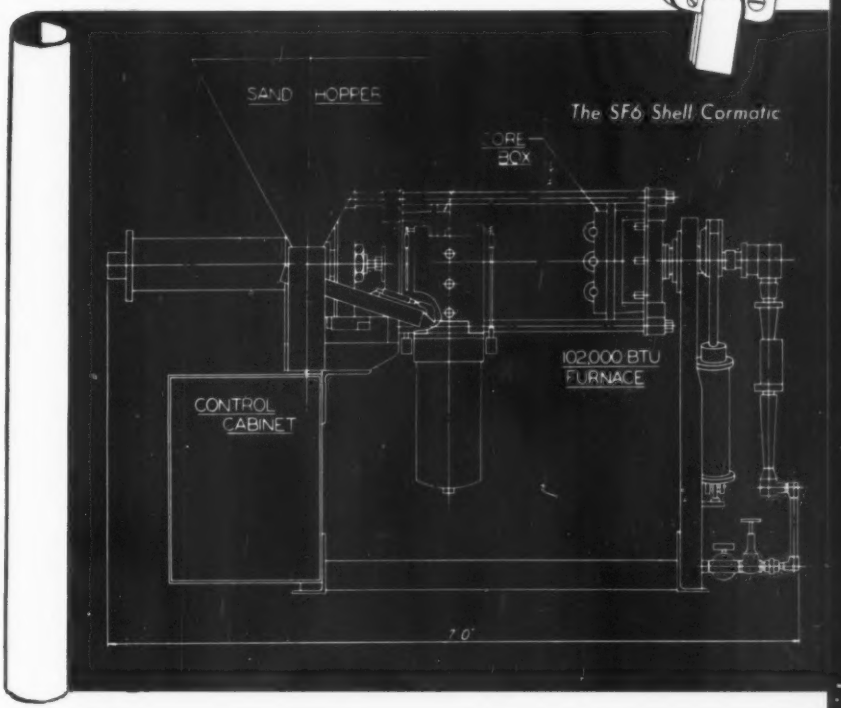
Procedure includes use of automatic molding machines, special molding sands, and a unique sand control system. Cast crankshafts can be made much closer to finished dimensions than the forged product so that less metal has to be removed by machining. Additionally the casting process permits counterweight shapes and spacings not attainable in a forging.

Circle 668 on Page 53→

HERE ARE COST-CUTTING DEVELOPMENTS FROM THE BEARDSLEY & PIPER TECH CENTER

A New Low-Cost Unit for Hollow Shell Cores

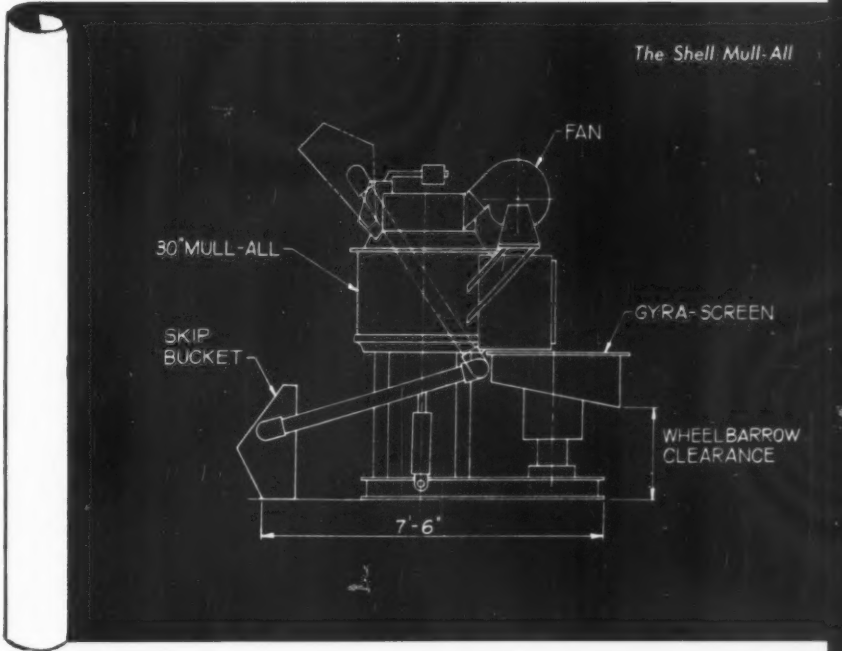
The SF6 Shell Cormatic unit has been developed to fill a pressing need for a low-cost, highly productive but flexible, shell core unit. A single-station, shuttle-type hollow shell core machine, it is available as either a manually-operated or semi-automatic unit. With the semi-automatic model, a single operator runs several of the new Cormatic units. This new, low-cost package features a gas-fired 102,000 Btu. furnace for fast curing of the shell cores. Core box size to a full 10 x 12 inches and heights to 18 inches are handled. It is flexible enough to handle a very wide range of small core boxes, and is an all-purpose unit for the foundry entering the shell coremaking field. Tests completed at the B&P Technical Center indicate that the new SF6 Shell Cormatic provides appreciably lower operating costs than other units of its size and type. It may well prove the difference between profit and loss on shell core jobs within its wide range.



The SF6 Shell Cormatic

A Revolutionary Economy Package for All Shell Sand Preparation

The Shell Mull-All, developed at the Technical Center and proved for all shell sand processing applications, is a complete low-cost, ready-to-operate package. It incorporates skip-bucket loading device, Shell Mull-All, and a cooling and conveying screen. The unit is productive, compact and completely flexible for all coating applications . . . for cold or preheat shell sand processing. Yet, with all of its advantages, its price places it within the budget of even the smallest foundries employing shell molding or shell coremaking processes. This new package unit has ample capacity to provide for all shell sand processing for a small shell molding department, or for several high-speed shell coremaking units.



The Shell Mull-All

FOREMOST DEVELOPER OF FOUNDRY MACHINERY

SANDSLINGER • SPEEDSLINGER • HYDRA-SLINGER • SPEEDMULLOR • PREPARATOR • SPEEDMULLOR-PREPARATOR UNIT • SHELL SPEEDMULLOR • MULL-ALL • MULBARO • LAB MULBARO • PNEU-RECLAIM • FORMATIC SHELL MOLD UNIT • CORMATIC SHELL CORE UNIT • FLEXIBLO • SAN-BLO • WHIRLMIX • ROL-A-DRAW • ROTO-MOLD • ROTO-FEED • HYDRA-MOLD • BEEP • SKIPTROL • MULLTROL • MULLTROLMATIC • BLOMATIC • CORMATIC • NITE GANG • MAGNARATOR

B&P

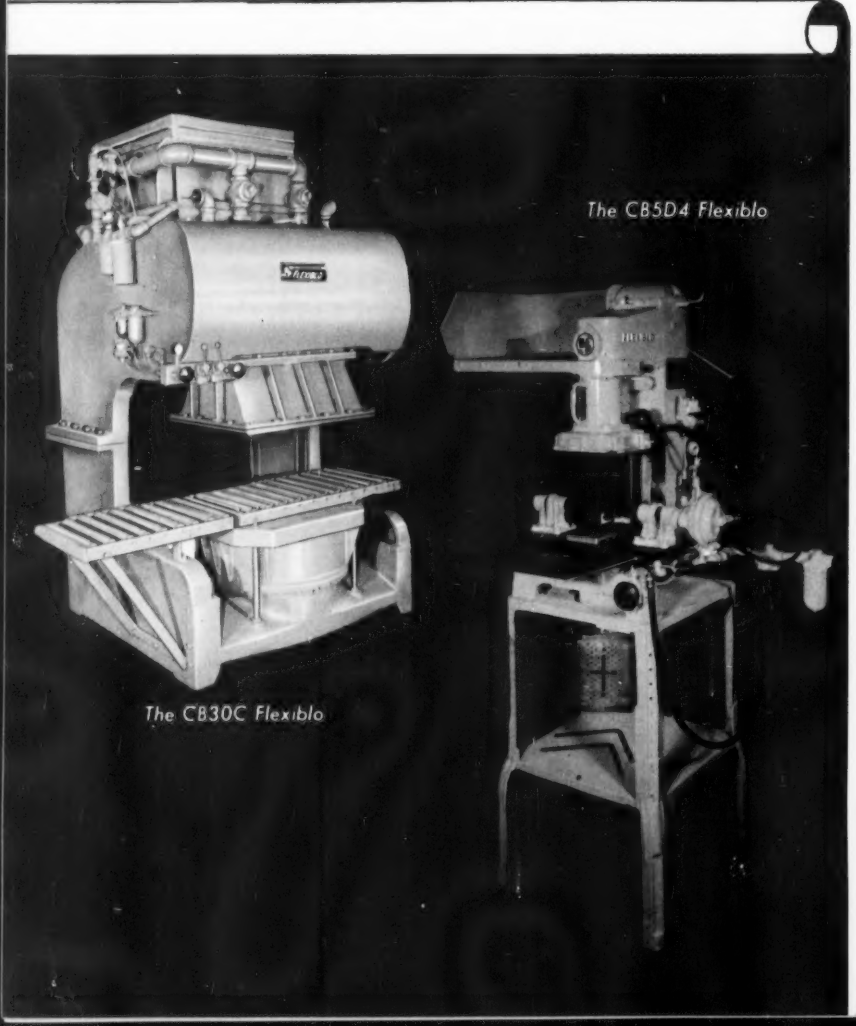
DEVELOPMENTS FROM THE B&P TECH CENTER

A Size and Type of Coreblower for Every Practical Need (CO_2 TOO)

Product expansion and development in the coremaking field now permit B&P to offer a unit to meet every coreblowing requirement. Outstanding units for jobbing or repetitive production of shell, CO_2 or conventional cores are available in a complete range of sizes, to meet every need.

1. For tiny pin cores and up to 400 pound cores.
2. For wooden, metal, metal-reinforced or plastic core boxes.
3. For vertically-split horizontally-split or open core boxes.
4. For all conventional, shell and CO_2 core sands.
5. For high strength and special core sands requiring agitator.
6. For full pressure blow, Pulsator blow or Low Pressure Prefill with blow.
7. For applications requiring quick-change or universal blow and vent plates.
8. For every CO_2 blowing requirement . . . (a complete line of Flexigas gassing units also available).

And a complete line of accessories including Rol-A-Draw and Rol-A-Cor core rollover-draw units.



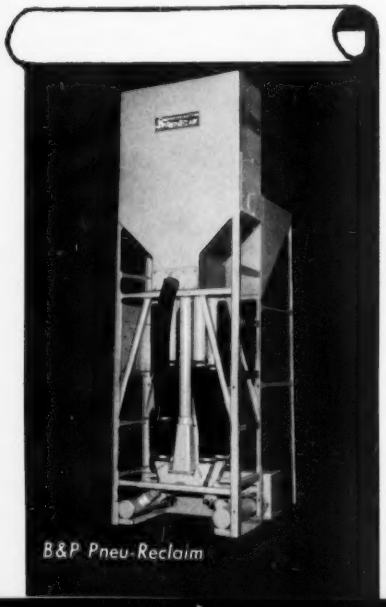
The CB5D4 Flexiblo

The CB30C Flexiblo

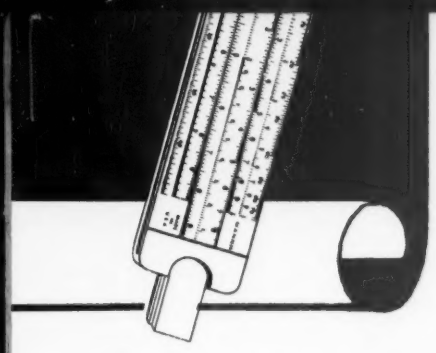
A Compact, Inexpensive Dry Sand Reclamation Unit for All Sands

There are important reasons for the foundry industry's acceptance of Pneu-Reclaim dry sand reclamation units by a 3-to-1 margin over all other units. These reasons permit gray iron, steel and non-ferrous foundries to obtain impressive savings, and to retain the full benefit of savings through minimum operating and maintenance costs.

1. Only Pneu-Reclaim has been thoroughly proved for the reclamation of every type of sand—conventional backing, facing and core sands, as well as CO_2, shell and air-setting sands . . . proved at the B&P Tech Center and in the field.
2. Only Pneu-Reclaim—with exclusive Dual-Jet Scrubbing—operates at half the air pressure (and half the power consumption) of other units.
3. Only Pneu-Reclaim has exclusive B&P Level Flow—makes it more compact with much lower overall height—installs easily in many areas where other units won't fit.
4. Only Pneu-Reclaim offers higher capacity—per square foot of area or per dollar invested.
5. Pneu-Reclaim maintenance costs are less than half those of any other unit.



B&P Pneu-Reclaim

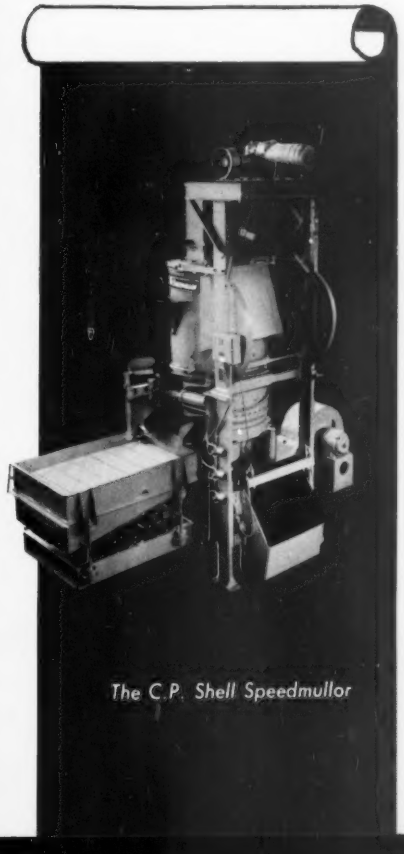


Shell Sand Processing Equipment Proved for Every Application

Hot process, warm process and cold process Shell Speedmullors all benefit from the extensive research and development work carried on at the B&P Technical Center. As a result of this work—carried on with the co-operation of leading resin and sand manufacturers—the capacity and performance of shell sand Speedmullors have been greatly increased.

In one series of tests utilizing preheated sand in a hot process Shell Sand Speedmullor, processing capacity has been increased over one hundred per cent.

The B&P line of Shell Sand Speedmullors provides the industry with by far the broadest and most flexible coating equipment available for shell sand processing. Seven different sizes in hot, warm and cold process units assure a coating unit to meet every requirement, under every operating condition. Capacities to 27,000 pounds per hour.



The C.P. Shell Speedmullor

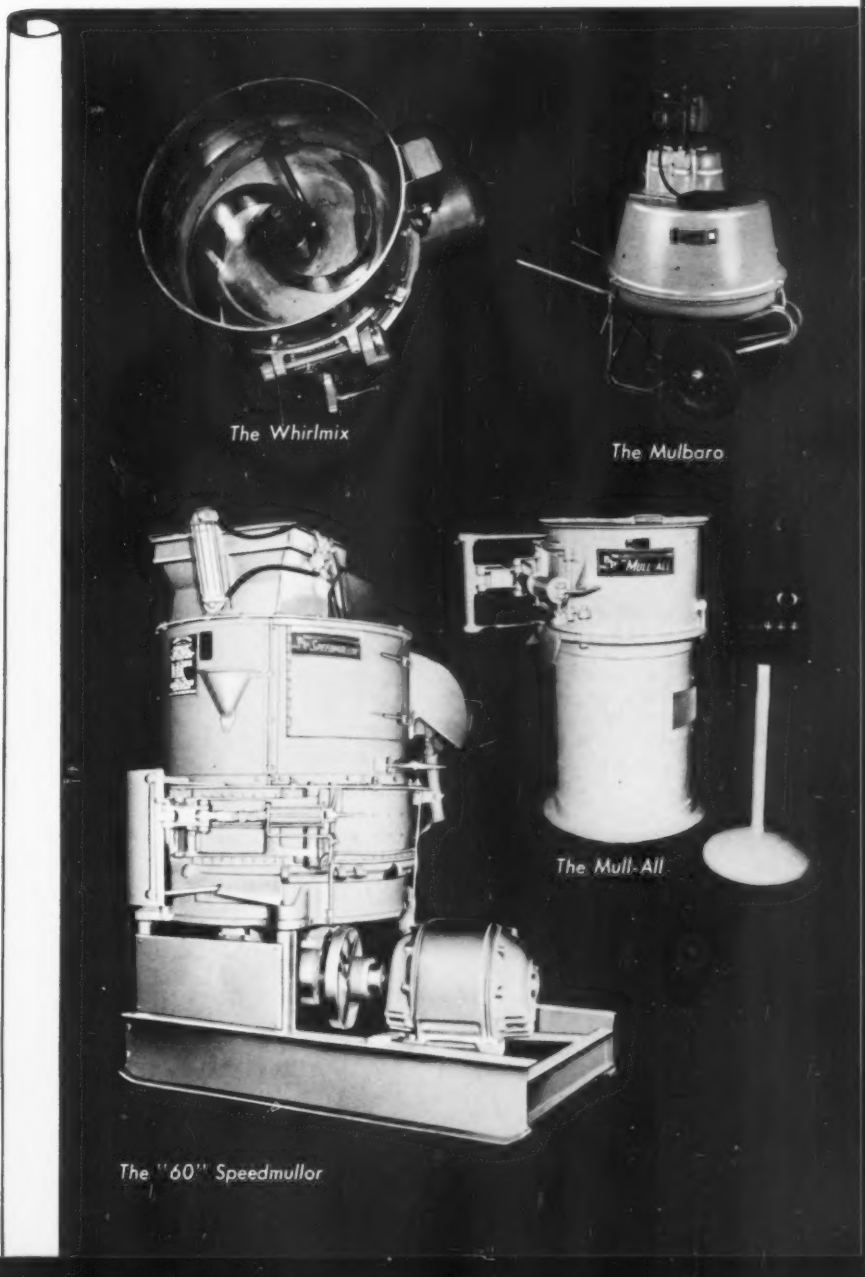
The Broadest Line of Mulling Machinery Ever Offered

In the field of molding and core sand preparation, the expansion of the Beardsley & Piper line of mulling machinery, with the addition of the Whirlmix and the Mull-All, now provides the most complete line for all applications. The Mulbaro remains the only truly portable mulling unit. Its overall application to molding and core sand preparation is combined with its true portability and low cost to provide unbeatable advantages in its field.

Available in two sizes, the compact and flexible Whirlmix is ideal for core sand preparation. It is especially suitable for the new CO_2 and air-setting core sand mixtures. Its low cost makes it an excellent investment for the foundry entering these fields.

The new Mull-All is the only small muller that offers the quality and ruggedness advantages of big production unit construction. Its capacity, performance and thoroughness of mixing are well ahead of other small units.

The advantages of the Speedmullor line—including six units with capacities to 76 tons per hour of thoroughly mulled sand—are well known. Speedmullors alone offer *rubber-to-rubber mulling, complete aeration during mulling, mulling in suspension, complete cooling during the mulling cycle,* and mulling cycles at least *three times faster* than any other unit.

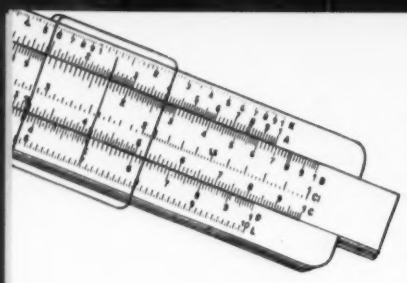


The Whirlmix

The Mulbaro

The Mull-All

The "60" Speedmullor

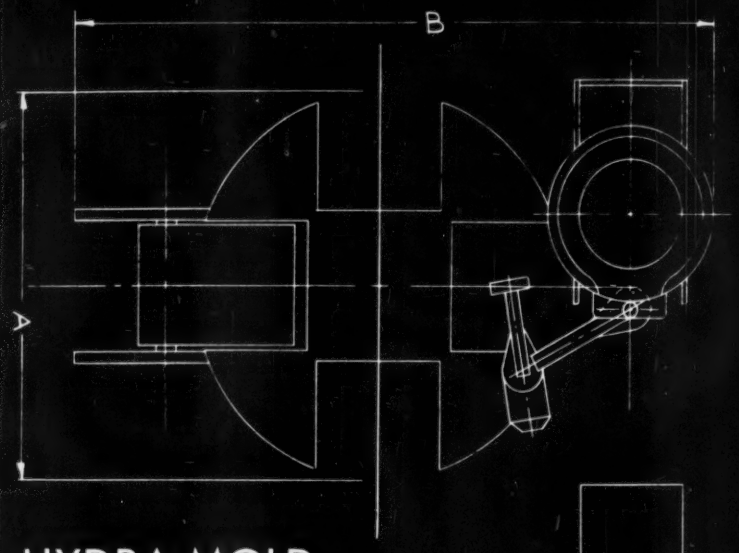


A Highly Productive — Yet Fully Flexible Complete Molding Unit — Without Pits

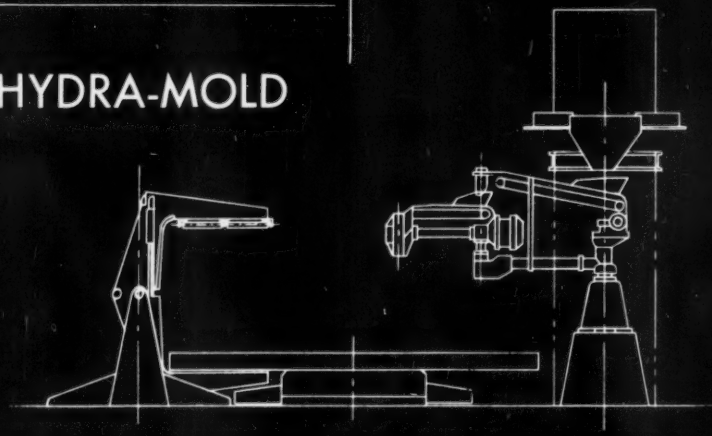
The new Hydra-Mold is the culmination of Beardsley & Piper efforts to develop the most compact production or jobbing molding installations. It incorporates all-hydraulic Roto-Mold, Rol-A-Draw and Hydra-Slinger. A single, low-cost hydraulic unit is used for the entire Hydra-Mold. Here is the unit that makes production work faster and more accurate than ever before—that permits jobbing work to be handled like production work.

These units offer production equivalent to—or greater than—that obtained from four large fully rigged molding stations. Yet, costs are reduced because sand is delivered to a single point of use, the Hydra-Slinger. Although the foundry has all of the flexibility of four separate stations, a single rollover-draw machine is needed. Because separate molding operations are performed at separate molding stations around the Roto-Mold Table, even miscellaneous jobbing work can be handled like repetitive production work. There's real production flexibility, too, with four patterns run simultaneously—any size work, any height molds within the range of the unit can be handled without slowing the operation. Pattern changes can be made instantly—without downtime.

This is the unit that keeps costs in line regardless of the level of operation. As few as two men or as many as six men can be assigned to the unit, depending on the production required. Best of all, there are no pits required—the entire unit is installed above-floor level. Only the B&P Hydra-Mold offers all of these advantages.



HYDRA-MOLD



*,**Roto-Mold Diam. "A"	*Rol-A-Draw Model	Length "B"	Max. Weight of Flask, Pattern & Sand	***Flask Size	Max. Draw
14'0"	2022H	25'0"	2000 lb.	36" x 56"	20"
16'0"	4025H	28'0"	4000 lb.	40" x 66"	23"
16'0"	6030H	28'0"	6000 lb.	48" x 72"	28"
18'0"	9030H	30'0"	9000 lb.	53" x 84"	27"
18'0"	12032H	31'0"	12000 lb.	54" x 90"	28"
18'0"	15032H	31'0"	15000 lb.	54" x 90"	27"

*Roto-Mold—Rol-A-Draw combinations to meet typical requirements. Other combinations may be recommended for specific conditions.

**Four, six, or eight station available.

***Normal flask size shown for four station Roto-Mold.

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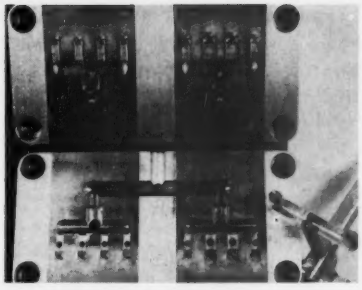
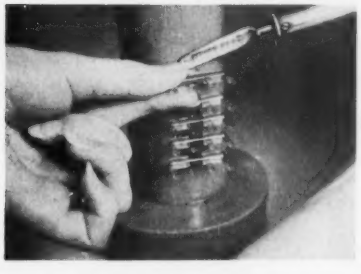
B&P

BEARDSLEY & PIPER

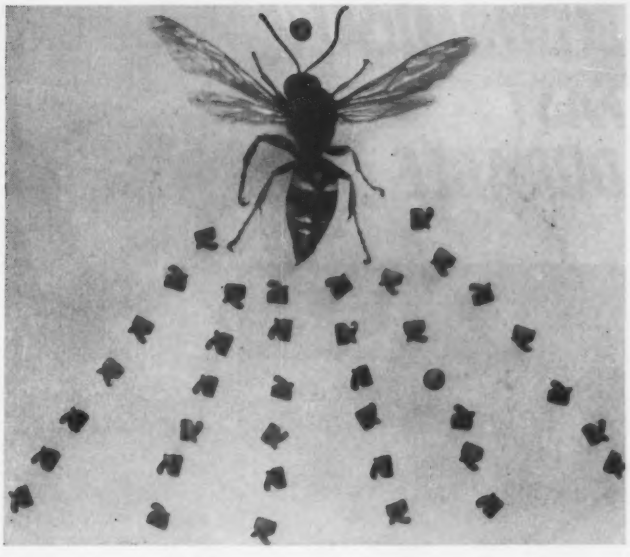
Div. Pettibone Mulliken Corp.
2424 N. Cicero Avenue
Chicago 39, Illinois



Two, four-pattern plastic assemblies are shown in top half of hobbed, beryllium copper die



An electrically-heated tool is used to weld gate of a four-pattern assembly to wax sprue



CASTINGS ... 354 to the Ounce

By ROBERT H. HERRMANN
Associate Editor

● WEIGHING 354 to the ounce, the two-bladed, stainless steel vane shown here makes a strong bid for the title of the tiniest of tiny castings. Each weighs about 0.00283 oz, and over-all dimensions are $\frac{1}{8}$ in. x $\frac{1}{8}$ in.

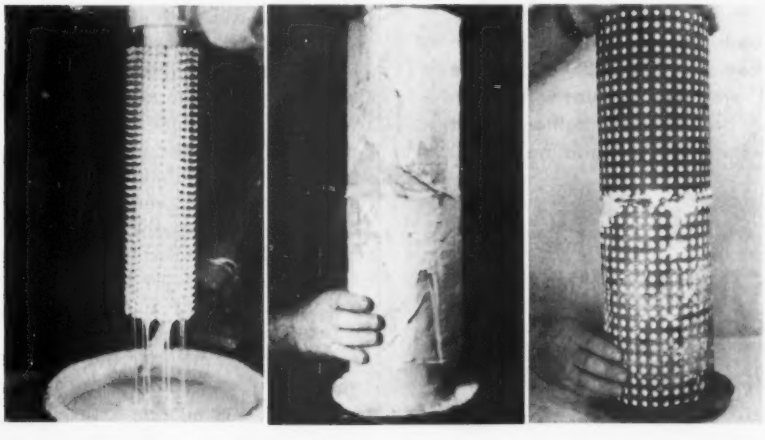
Foundry engineers at Precision Metalsmiths Inc., Cleveland, where the castings are made, have figured that the Cicadea killing wasp, which is reputed to be able to carry twice its weight, could carry 39 of the vanes. This particular wasp has a wingspread of about 2 in.

The vane is used to atomize fuel in the engine of a self-propelled bomb. The investment-cast part is used as-cast after the casting is sand blasted, and the gate stub is ground off.

Plastic Patterns—Polystyrene patterns used to make the investment molds are produced in an eight-cavity, die-hobbed beryllium copper die mounted on an automatic machine. Plastic at 400° F is injected into the die at 18,000 psi. Water circulated through the die keeps it at 87° F during pattern production.

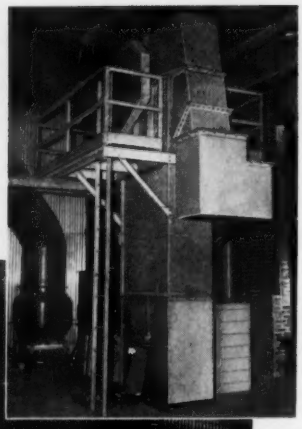
The eight-cavity die produces two, four-pattern assemblies, including gates and runner bar. Production is at the rate of 1000, four-pattern assemblies in 8 hr. These assemblies are wax-welded to a $1\frac{5}{8}$-in.-diam wax sprue mounted on a plywood base plate to form a tree of 1024 individual patterns.

Workers dip the tree of patterns into a prime coat of slurry consisting of 44 or finer micron (325-mesh screen) silica flour mixed with silica sol to a consistency of 2000 centipoise. When the prime coat has dried at room temperature a perforated metal flask wrapped with heavy paper is placed around the tree and molten wax is flowed around the junction of flask and



Far left: Tree of patterns is dipped into prime coat slurry. Center: Paper-wrapped flask is placed over prime-coated tree. Right: Flasks look like this after firing in burnout oven

• ECONOMICAL
• FAST
• DURABLE



WEBSTER Leak-Proof Apron Conveyor and Bucket Elevator for handling shot and refuse at Lynchburg Foundry, Lynchburg, Va.

Webster conveyors for . . .

SAND, SHOT, MOLDS, CASTINGS, REFUSE, Etc.

WEBSTER conveyor systems for foundries have proved so outstandingly successful because they are ENGINEERED to the specific working conditions and problems of each foundry. There is no obligation in having one of our engineers visit your plant to study and discuss your material handling needs. Write us today.

Webster MANUFACTURING, INC.

DEPT. F-49, TIFFIN, OHIO

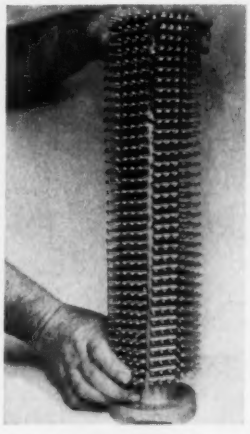
BULK MATERIALS HANDLING EQUIPMENT

SINCE 1876

Offices in all Principal Cities

plate to hold them in position.

Because completed molds are poured under a vacuum, the flasks are perforated to permit effective application of the vacuum through the porous refractory mold material to the mold cavity. Flasks also have a circular flange about an inch from the bottom which seals the mold in the vacuum



Cast setup following removal from mold and sand blasting

chamber during metal pouring. The paper wrapping is necessary to contain the mold slurry within the flask during the investing operation. It burns away in the pattern removal ovens.

Flasked pattern assemblies are invested with the mold slurry. It consists of a phosphate-bonded silica refractory graded from 30 mesh to flour size to achieve the desired permeability. One hundred parts by weight of the refractory is mixed with 18 parts of water to achieve a flowability necessary to get tight packing around each of the small patterns.

Filled flasks are air-dried from 4 to 6 hr. The plywood base plates are removed and the molds put in a gas-fired, batch oven where the wax sprues are melted out of the molds. Molds remain in the ovens for 12 hr at 180° F. Then they are transferred immediately to other ovens where the temperature is raised from 200° F to 1800° F at the rate of 200° F per hour. Molds are held at 1800° F for 4 hr to assure complete combustion of all plastic pattern material and residual wax.

Pour in Vacuum — Workers re-

THE MORE SNAGGING WHEELS YOU USE the more you need·····

NEW MACKLIN B-20

RESINOID BONDED SNAGGING WHEELS

B-20 Gives fast, fast cutting action.

B-20 Gives improved "G" ratio. Removes more metal per wheel.

B-20 Has more heat resistance.

B-20 Is versatile. Tops for swing frames, automatics, floor stands, portables, *cut-off, too!*

B-20 Gives better impact resistance because of higher tensile strength.

B-20, Macklin's newest "Wheel of Profit" cuts time and costs on so many every day snagging jobs. IN THE FOUNDRY, it eats up fins, gates, and risers at a fast clip. And, the money they save, the job they do on BILLET GRINDING. On this tough job, in test after test, B-20 proved tops! For production cutting, on high speed cut-off machines, the new B-20 cut-off wheel cuts bars, rods, angles, tubes and flats with speed and economy.

Try a B-20 in your plant, on your own job. A letter or phone call to your nearest distributor is all that's needed. If you prefer, write us direct. We'll do the rest.

NEW B-20 FOLDER, YOURS FREE!

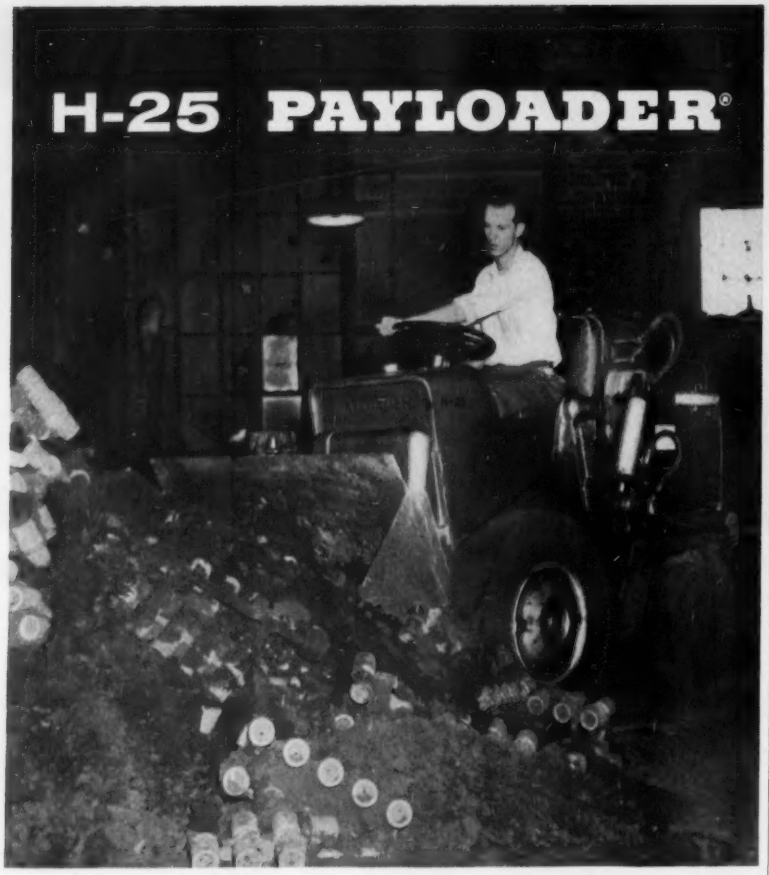
For complete specifications and user reports send for your copy. You'll find it's a smart move.

GRINDING WHEELS

MACKLIN company Dept. 22, Jackson, Mich.

Macklin of Canada, Ltd., Harrow, Ontario, Canada

Circle 651 on Page 53



"bigger loads–faster–more powerful–considerably shorter turning radius"

Mr. O. W. Street, Gen. Supt. of Parker-Street Castings Company, Cleveland, Ohio also adds that "the Model H-25 'PAYLOADER' is superior to any previous sandmoving equipment used — also does numerous jobs previously impossible to do with our other loaders."

360 Tons Per Day

This gray iron foundry uses the H-25 for three basic jobs each day: pick-up of sand and castings from the floor and delivering same to shake-out; moving sand from shake-out to muller; delivering sand to the many molding stations. Average haul is 140 feet and the amount moved daily is 120 tons in each operation, or 360 tons total.

The greater carry capacity of the Model H-25 (2,500 lbs.) is 25 to 50% more than heretofore available in a tractor-shovel with 6-ft. turning radius. The power-shift transmission, torque converter and power steer make it fast cycling and easy operating. Power-transfer differential — another exclusive in its class — gives the Model H-25 better traction on loose or slippery footing.

Get the facts on the Model H-25 from your Hough Distributor.

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LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

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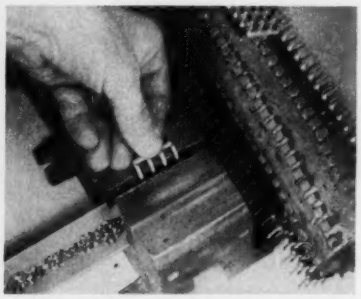
4-A-2

move molds from the high-temperature ovens and put them immediately into small vacuum chambers for pouring with 347 stainless steel. Forced removal of gases from molds suspended in the chamber by the flanges around the flasks minimizes possible porosity in the castings. Also, atmospheric pressure, working on the open sprue, forces molten metal into the mold cavity. This method of pouring aids in producing castings with good surface finish and fidelity to pattern configurations.



An air-operated trim die cuts four castings from the gates simultaneously without leaving a stub. No grinding is needed

When molds have been removed from the vacuum chambers and cooled, workers hammer the flask lightly to loosen and break the mold, which is quite fragile at this point. With the flask removed, workers rap the sprue sharply with a hammer to remove most of the pattern material from the cluster of castings. The cluster then is sand blasted in a reach-in cabinet.

Workers cut the clusters of four castings from the metal sprue with an 8-in. abrasive wheel. The castings are degated four at a time in an air-operated trim die at an average rate of 2000 per hour. The trim die degates the part to meet blueprint dimensional tolerance without further gate grinding. Inspectors check each casting under an illuminated, ten-power magnifying glass for possible surface defects before shipment.

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Tousey's water reduceable sealer has no undesirable odor and it is non-toxic. Being free of flammable solvents it is also safer to use.

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Tousey's water reduceable sealer meets the performance requirements of leading automotive and agricultural manufacturers. It is available in standard sealer colors.

Tousey also manufactures Lacquer, Rubber base, Alkyd and Hot Dipping type sealers.

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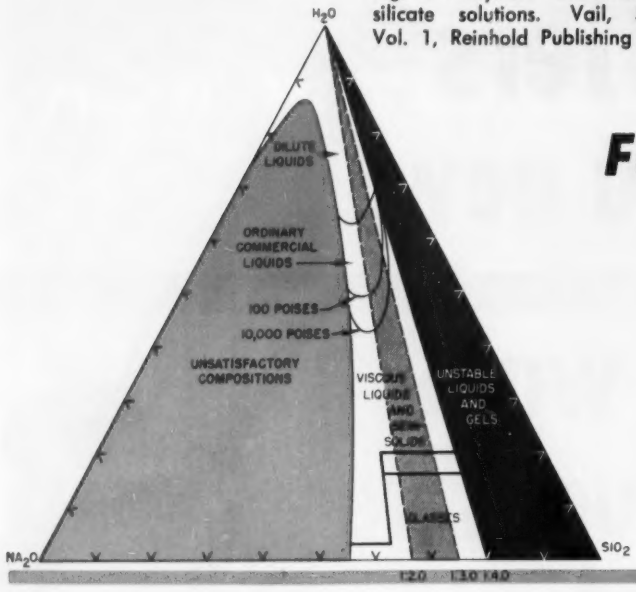

Fig. 1 — Physical characteristics of sodium silicate solutions. Vail, *Soluble Silicates*, Vol. 1, Reinhold Publishing Co., N. Y., 1952

Factors Affecting . . .

Sodium

● FOUNDRYMEN continue to find new molding and coremaking applications for the sodium-silicate, CO_2 process. To assist them in tailoring the composition of the sodium-silicate solution, the gassing procedure, and the drying procedure to specific applications, basic studies of the process were conducted at the Naval Research Laboratory.

It was found that most of the behavior of sodium-silicate water mixtures could be predicted or explained by reference to a three-component phase diagram (Fig. 1) with superimposed viscosity curves. Any point on the diagram represents a specific and unique composition of SiO_2, Na_2O, and H_2O.

Setting of the binder is accomplished by any mechanism that will move the composition from a low-viscosity curve to a high-viscosity curve. Actually, this can be done in two ways—either by removing water by evaporation in air or oven drying, or by introducing an acid material such as carbon dioxide into the sodium-silicate sand mixture. The carbon dioxide reacts with the Na_2O, producing sodium carbonate (Na_2CO_3) at the expense of the Na_2O in the sodium silicate. As the Na_2O is used in the reaction, the ratio of SiO_2 to the remaining Na_2O is increased and the composition of the remaining binder moves toward the high-viscosity curves as shown in Fig. 1.

Gassing (blowing CO_2 through the sand) and drying may be used separately or in combination. Drying alone gives low initial strength but very high strength in one to three days when the water has had a chance to evaporate. Gassing alone gives moderately high strengths in a matter of seconds which may or may not deteriorate during storage. Detailed quantitative data on this phase of the process are presented in "Sodium Silicates for the CO_2 Process," *Transactions*, American Foundrymen's Society, 1958.

It is this rapid development of strength produced by gassing which is so attractive to foundrymen, since it provides a means of hardening cores without baking them and of hardening molds without oven drying. This report contains information related to the performance of sodium-silicate-bonded sand in molds and cores.

Green Strength—Molding sands bonded with sodium silicate require special molding techniques because of the unusual characteristics of the mixture. They are relatively sticky and, in the ungassed condition, quite weak. If the patterns are drawn after the sand is hardened with CO_2 they must be very strong, have excellent draft, and be free of nicks and other imperfections in order to be removed. Parting compounds must be applied liberally to prevent sticking of sand to the pattern, and molding tools must also be dusted frequently if they are to be used for finishing or patching.

Green strength is an important property, particularly for molds hardened by CO_2 after the pattern has been drawn. In this case the sand must have sufficient strength to overcome frictional forces during the pattern draw operation and to support itself without distorting until the sand has been hardened. In the green stage the sand particles are held together only by a liquid of heavy-syrup consistency; therefore the green strength is very low compared with green strengths of clay-bonded molding sands and is more comparable to the green strength of conventional core sand. Since small amounts of clays or corn flour are added to oil-sand mixtures to improve strength, the effects of these additives on the green strength of sodium-silicate-bonded sand were investigated.

Green strength was determined in a specially designed shot-loaded compression testing machine which interrupts the flow of shot when the specimen either breaks or deforms 0.170 in. in a 2-in. specimen. The shot is then weighed and this value is converted to pounds per square inch. To make it possible to measure the strength of very weak specimens, the specimen is stripped on a steel pedestal. The pedestal, with

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Metal Processing Branch, Metallurgy Div.
U. S. Naval Research Laboratory
Washington

Silicate-Bonded Sands

Suggestions are made for proper sand mixes, CO_2 gassing time and the use of washes, vents, and rods to control green and retained strength, metal penetration, gas evolution, and distortion

the specimen on top, is removed from the specimen tube and placed in the testing machine without touching the specimen itself. In this way, specimens with strengths as low as 0.2 psi can be tested quite easily.

The effects of a strong clay (western bentonite) and a gelatinized corn flour on the green strength of sand with 5 per cent sodium silicate are shown in Fig. 2. Since both the clay and the corn flour absorb water, and when added alone they reduce the green strength, various amounts of water were added to activate the dry materials and preserve the strength developed by the sodium silicate itself.

Adding water alone to a sand and sodium-silicate mixture had little effect on the green strength; the green strength was essentially constant at 1.2 psi for water additions up to 1.5 per cent. Unlike conventional core sand mixtures, the strength of the sodium-silicate sand with 1 per cent corn flour decreased in green strength with increasing amounts of water.

Since sodium-silicate sand is hardened without baking, any dry strength due to corn flour is not required, therefore the flour is not a useful agent for improving the strength properties of sodium-silicate-bonded sands.

Green strength of the sand containing 1 per cent western bentonite, Fig. 2, increased in strength with increase in added water, but the maximum strength at 1.5 per cent water was only about 10 per cent higher than the strength of the sand with sodium silicate alone. Since the sodium silicate itself contains 50 to 60 per cent water, and problems from rapid steam formation may develop from this amount of water the use of clay with additional water to develop green strength is not recommended if the molds and cores are not dried prior to casting.

Since conventional core sands are worked at green strength levels considerably below those of sand containing sodium silicate, the best approach for combating sand failures in the green state is (a) to use a sodium-silicate solution with the lowest water content that can be dispersed readily in the sand during a short mixing cycle and (b) to use high-quality patterns with release agents to minimize the stress during the pattern draw operation.

Shakeout — Sodium-silicate-bonded cores do not inherently possess the highly desirable shakeout characteristics of most oil-bonded cores, which in some cases may literally

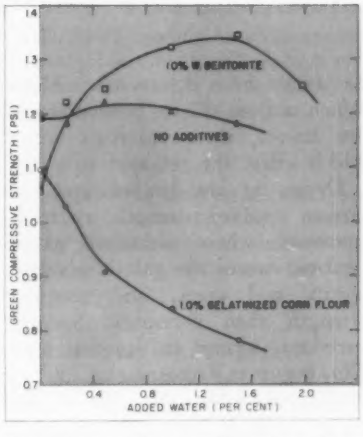

Fig. 2—Corn flour and western bentonite affect green strength of silicate sand. Mix: 95% AFS 80 sand; 5% Na_2SiO_3; silica-soda ratio is 2

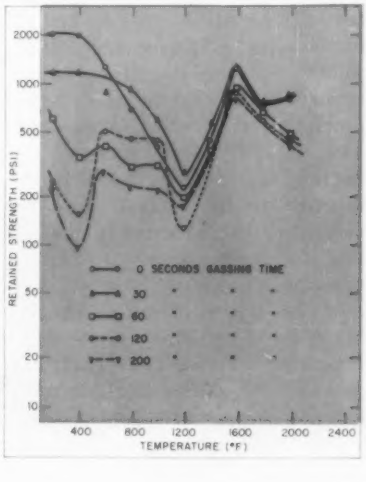

Fig. 3—Gassing time affects the retained strength of sand heated for 1 hr at various temperatures. AFS 80 sand; 0.3 cfm gas flow rate; the silica-soda ratio is 2

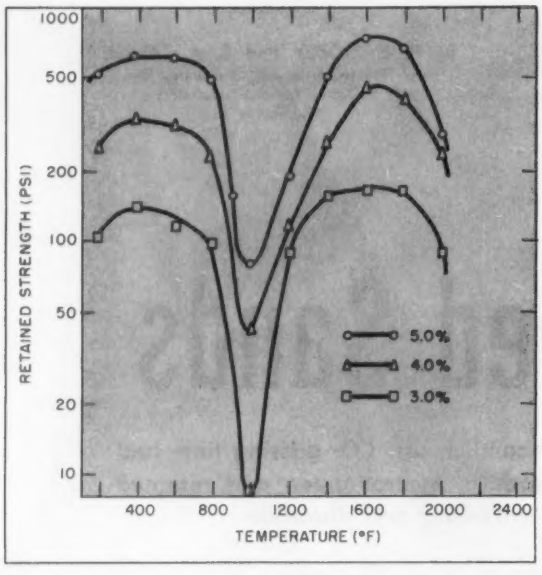

Fig. 4—Sodium silicate content affects retained strength of sand heated 1 hr at various temperatures. AFS 50 sand; gassed for 120 sec at 0.3 cfm; the silica-soda ratio is 2.38

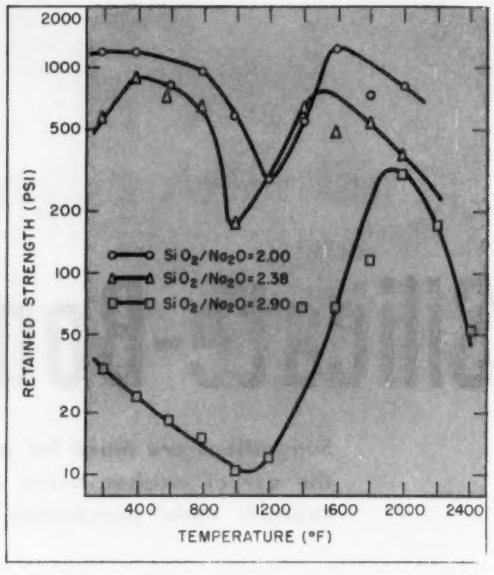

Fig. 5—The silica-soda ratio affects the retained strength of sand heated for 1 hr at temperatures indicated. AFS 80 sand; sodium silicate 5%; gassed for 30 sec at the rate of 0.3 cfm

be poured from the cooled casting. When sodium-silicate-bonded sands are heated, three reactions occur which affect the retained strength.

Drying at low temperatures increases retained strength up to a maximum where additional water removal causes the gel vs. glass to shrink and crack, and retained strength then decreases. Sodium carbonate formed by reaction with CO_2 begins to decompose at 730° F, and fusion with the sand begins about 1200° F. Between these two temperatures the retained strength reaches a minimum value and then increases as the sand is fluxed at higher temperatures.

The effect of temperature on retained strength is similar for all simple mixtures of sand and sodium silicate, but the magnitude of the strength is affected by the gassing time, amount of binder in the sand, and the SiO_2/Na_2O ratio of the binder. These factors, which are inherent to the process, were investigated by determining the retained strength of standard-size compression-test specimens after they had been heated to various temperatures for a period of one hour.

Gassing Time—The effect of gassing time on retained strength, Fig. 3, was determined with a sand containing a low-ratio sodium silicate (SiO_2/Na_2O = 2.0) so the test would be sensitive to the gassing time variable. Fig. 3 shows that the high strength developed through dry g of undergassed sand persisted up to a temperature of 1000° F, and increasing the gassing time caused a marked decrease in retained strength in that temperature range. Above 1200° F gassing time had a negligible effect on retained strength.

While the benefits from an increase in gassing time would depend on the SiO_2/Na_2O ratio of the binder and the amount of binder in the sand, any increase in gassing time up to that for maximum gassed strength should result in a notable decrease in shakeout effort.

Amount of Binder—The effect of the *amount* of sodium silicate in a sand mixture on its retained strength is shown in Fig. 4. In this case a coarser sand, AFS 50, was used instead of the AFS 80 sand used in the previous experiments. The sodium silicate had a silica-soda ratio of 2.38 which readily reacts with CO_2, and the 120-second gassing time was sufficient to develop maximum gassed strength. Batches were made with 3, 4, and 5 per cent of the silicate solution and all specimens were gassed for two minutes at a gas flow of 0.3 cfm.

It is evident that decreasing the binder content decreased the retained strength drastically, regardless of the test temperature. The retained strength of the sand was halved for each 1 per cent reduction in sodium silicate at almost all temperatures. Therefore, keeping the sodium-silicate content to a minimum and thereby keeping the retained strength low is a very effective way to improve shakeout of molds for all metals.

Effect of Ratio—Fig. 5 illustrates the effect of the SiO_2/Na_2O ratio of the sodium silicate on the retained strength. With a ratio of 2.00, the retained strength was very high. At a ratio of 2.38, retained strength was decreased slightly over most of the temperature range, and the whole relationship between retained strength and temperature was shifted 200° F lower.

When the ratio was changed to 2.90, a very drastic drop in retained strength was noted for sand heated to temperatures below 2000° F, but the temperature for minimum strength was the same as that for the lower ratio silicates. For small-core applications where the cores are placed in molds after gassing with CO_2, use of high-ratio

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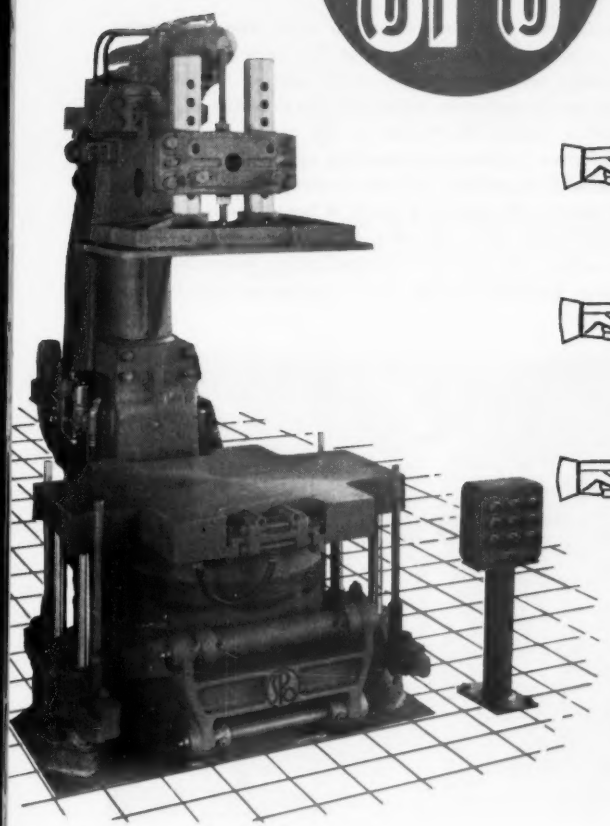

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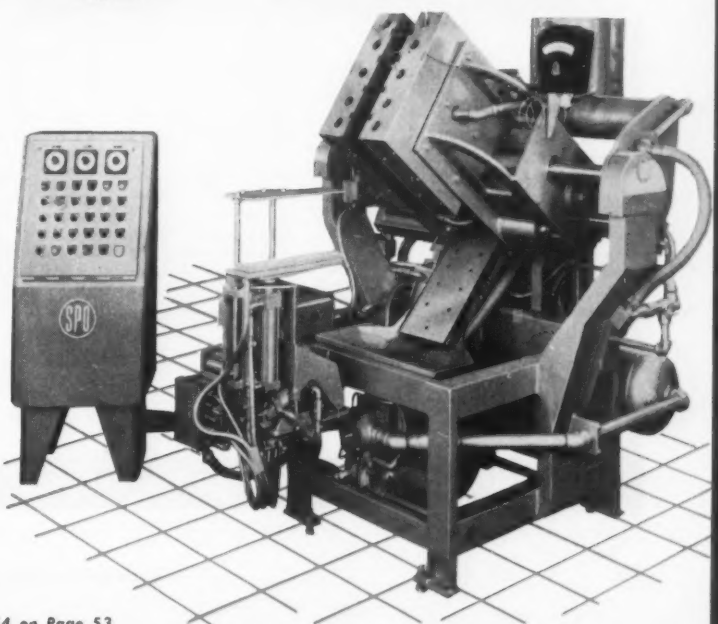
SPO's exclusive Angle-Blo holo-core MACHINE with fully automatic unloader

Blows, cures, strips, unloads a wide variety of hollow cores or shell molds, recharges sand magazines—automatically and *without* operator attention. Handles core boxes up to 16x21x9 inches, blows 30 lbs. of solid core.



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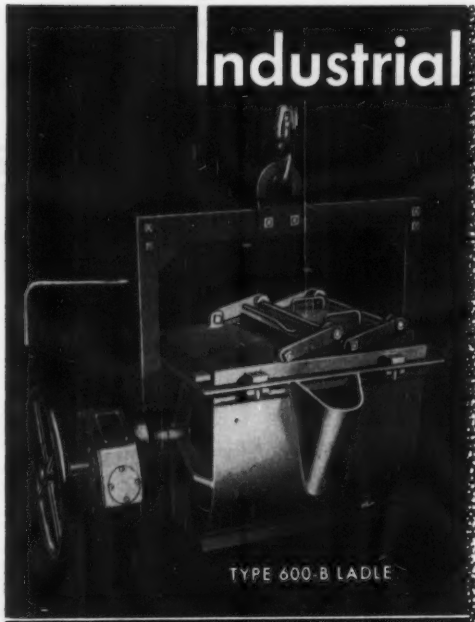
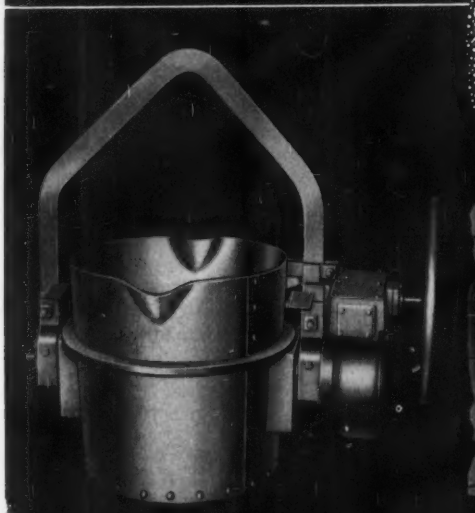
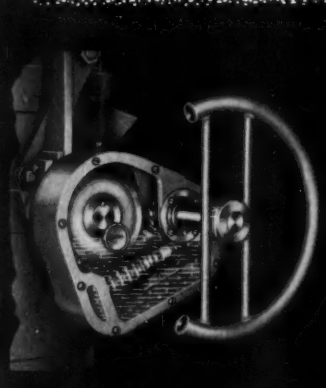


TYPE 600-B LADLE

Industrial Equipment Co. manufactures a wide range of geared ladles for every type of foundry service. For light duty pouring, specify Industrial ladles with Bantam worm gearing . . . for heavy duty pouring specify Industrial ladles with the exceptionally strong and dependable Timken worm gearing. The design and construction of both types of Industrial's gearing assemblies assure outstanding ease of operation, accurate pouring control and long trouble-free service. Binding as a result of heat distortion is eliminated—even if ladles are in constant use without a chance to cool. In addition to the many types of standard ladles, Industrial Equipment Co. also develops custom ladles for special applications.



TYPE 592-T LADLE



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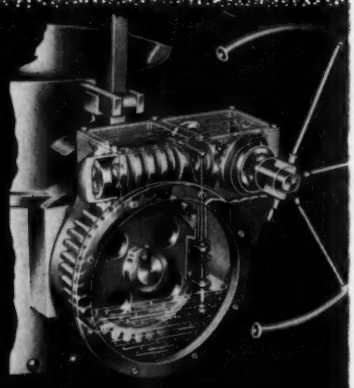

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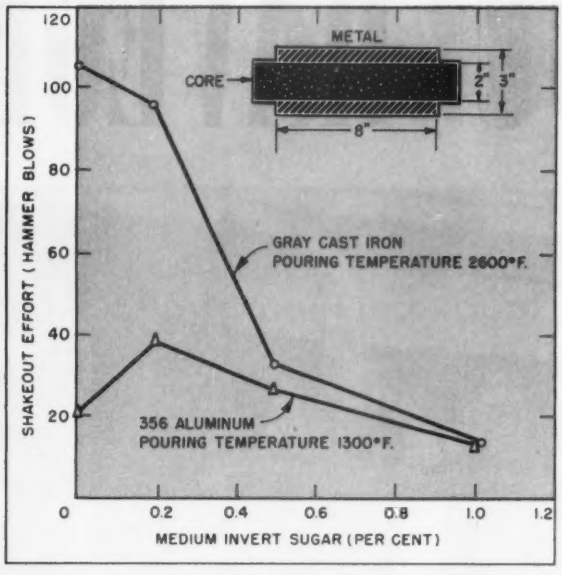


Fig. 6—The effect of liquid sugar on the shakeout effort required to remove a sodium silicate-bonded core. The sand mixture contains AFS 80 sand with 5% sodium silicate. The silica-soda ratio is 3.2

silicates has the advantage not only of rapid hardening with CO_2, but also provides easier removal of sand from the castings.

Additives—Some of the most effective additives for improving the characteristics of sodium-silicate-bonded sands are the liquid sugars. Medium invert sugars are syrupy liquids containing about 75 per cent solids which are 50 per cent invert sugars. These sugars are hygroscopic and when mixed with sodium silicates tend to stabilize the water content of the solutions.

Since a slight decrease in water content of solutions with high SiO_2/Na_2O ratios can increase the viscosity of solutions to the point where the solutions will not readily wet the sand, the liquid sugar addition assists in the dispersion of these solutions during the mixing operation and insures proper bonding during the molding operation. In addition to this feature, the liquid sugars improve the shakeout characteristics of the sand.

The retained-strength data from the laboratory tests predicted that sodium-silicate-bonded cores would be more difficult to remove from iron castings which heat the sand to the fusion range than from aluminum castings which heat the sand to the range of minimum retained strength. These two metals, therefore, were used in a service-type test to evaluate the effect of liquid sugar on the shakeout effort. Cores bonded with 5 per cent sodium silicate and containing 0, 0.2, 0.5, and 1.0 per cent of medium-invert sugar were set in clay-bonded sand molds, and the iron and the aluminum castings were poured at 2600° F and 1300° F, respectively.

The shakeout data obtained are presented in Fig. 6, and for the case where no sugar was added, the prediction from the laboratory test is clearly substantiated. The core in the iron casting required over 100 blows for removal. Obviously, a core requiring a shakeout effort of that magnitude would be impractical for production castings. The core in the aluminum casting required only 20 blows for removal.

Fortunately, the liquid sugar had a greater effect on the shakeout effort of the cores in the iron castings, and a 1 per cent addition of liquid sugar to the sand reduced the shakeout effort of the cores for both metals to a practical value of 13 blows. The 1 per cent addition of liquid sugar to the sand corresponded to a ratio of 1/5 of liquid sugar to sodium-silicate solution.

Penetration — Since molds and cores bonded with sodium silicate contain water that is loosely held and soda which is a flux-type bonding material, rapid evolution of water vapor and loss of refractoriness can occur and contribute

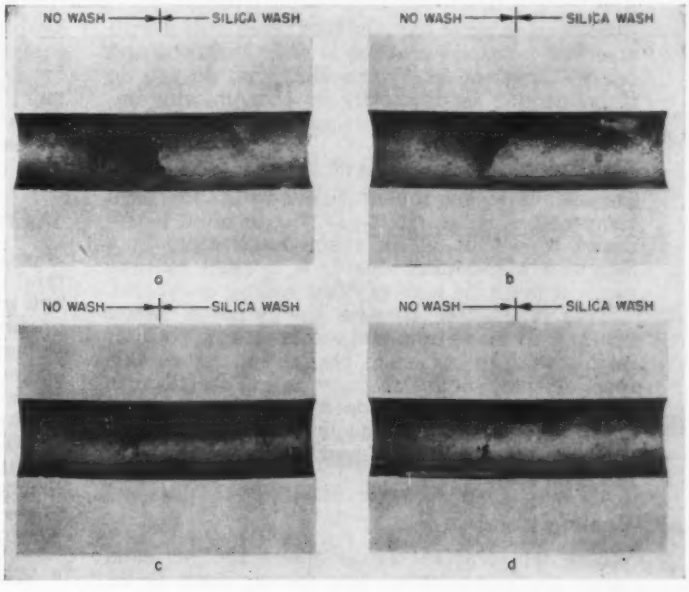
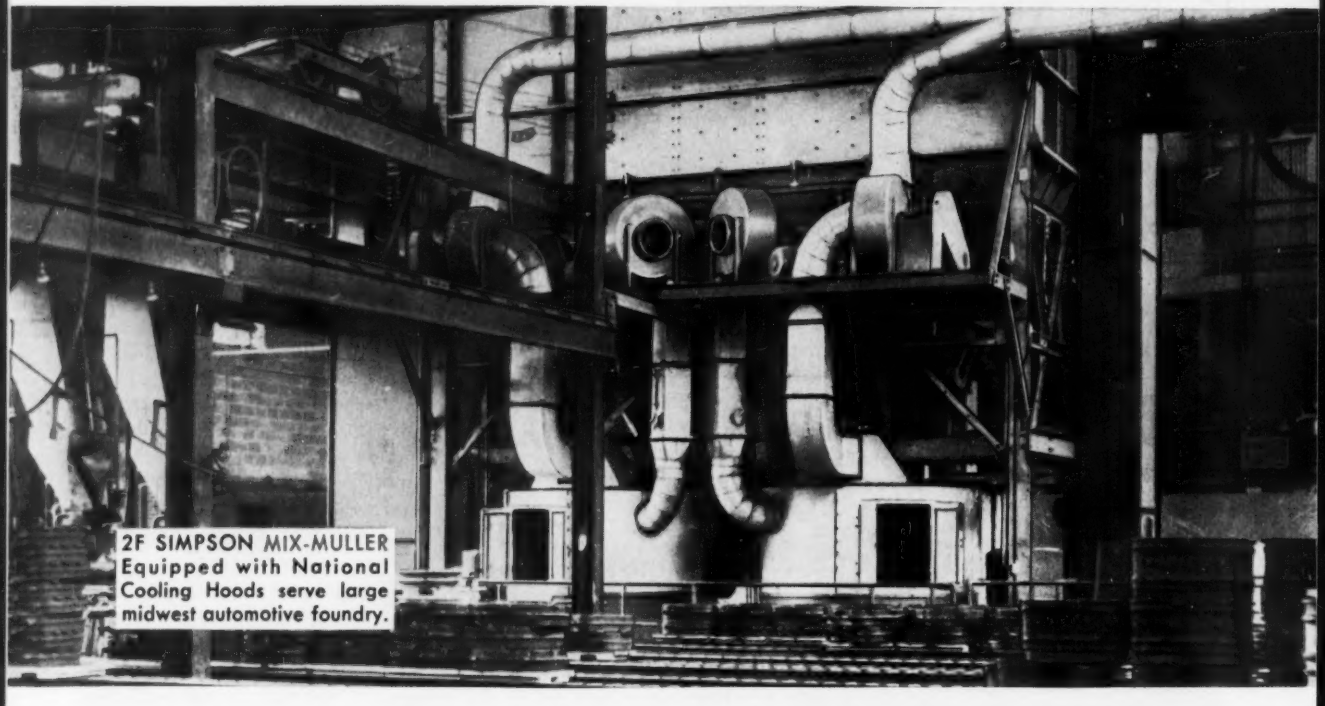


Fig. 7—The effects of additives and silica wash on metal penetration of sodium silicate-bonded sand are compared. Gray iron was poured at 2600° F. Molds contained AFS 150 silica sand with 5% sodium silicate, (a) no additive, (b) 10% silica flour, (c) 1% graphite, (d) 3% sea coal

—IF YOU HAVE A



2F SIMPSON MIX-MULLER Equipped with National Cooling Hoods serve large midwest automotive foundry.

. . .These simple facts may save you money

Foundrymen agree that the best place to deal with a serious hot sand problem is after shakeout and *before* storage or rebonding. But what do you do if pre-cooling is physically or economically impractical?

Can you cool in the Muller?

Depends upon the muller. Sands in the marginal temperature range (150°—175°) can often be reduced to within 20° of room temperature in a Simpson Mix-Muller during a normal mulling cycle, *without the need of extra cooling equipment.*

This is possible because the Simpson Mixer operates at an optimum speed necessary to thoroughly temper the sand. This action serves as a most efficient cooling medium and is described in cut (A). A simple way to determine whether or not *your* muller delivers this cooling action is to check the temperature of the sand before and *after* it has been mulled.

Cooling Hoods

Where temperatures range above 250° as sand comes to the muller, cooling usually must be induced by mechanical means in the muller. Here again, the cautious foundryman should judge equipment by personal inspection. He should ask for evidence that cooling equipment does not impair the quality and productivity of the mixing operation by calling for excessive binder additions and reduced batch size. A check of power costs is also important.

The National Cooling Hood

If you now operate a Simpson Mix-Muller or intend to purchase a mixer equipped for cooling, it will pay you to evaluate the practical design and operating characteristics of the National Hood shown here . . . *then prove them for yourself.*

You can do so by sending for a complete list of National Cooling Hoods built since 1950. Your National agent will be glad to arrange a demonstration of why and how the National Hood can effectively solve your hot sand problems at low first and operating costs . . . *without impairment to your mixing productivity or to the quality of the prepared sand.*

Write for further details today or call your *Man from National.*

.....NATIONAL ENGINEERING COMPANY.....

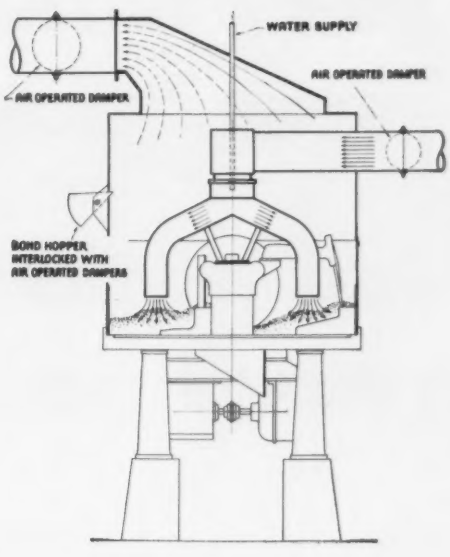
HOT SAND PROBLEM

THE NATIONAL ROTARY PUSH-PULL COOLING HOOD

Here's how it works:

Moisture is added and air is forced *through* the batch while sand is in a state of normal agitation (and maximum flowability) due to plow action. As moisture is evaporated, heat in sand is transferred to the vapor generated and is carried off in exhaust system. Slight negative pressure is maintained in mixer to confine dust within the mixer enclosure.

PLOW ACTION *holds key to effective cooling:* (see A, below) note that air is directed through sand as it cascades over the plow in a free flowing state . . . rather than from *below*—where higher air velocity would be required to overcome natural compaction of sand.

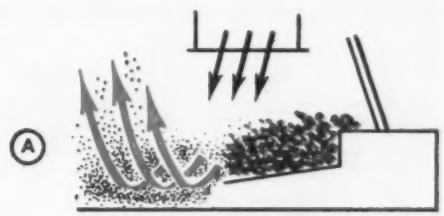


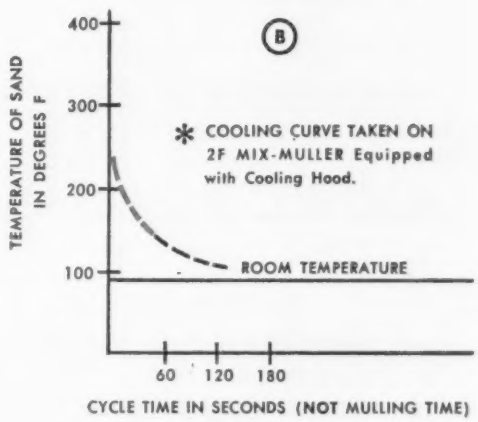
HERE'S WHAT IT WILL DO FOR YOU

The National Cooling Hood will reduce sand temperature from 250° to within 15 to 20° of nominal (90°—100°F) room temperature during a normal 2 minute mulling cycle. In addition, you get:

- **no loss to fines** . . . because excessive air velocity is not required. 6500 CFM is used (other systems require up to 11,000 CFM for a mixer of *smaller* batch capacity).
- **no adjustment to normal batch composition** is required to compensate for excessive moisture or loss of binders and additives through the exhaust system.
- **no loss in quality** of prepared sand.
- **no loss in productivity** or speed of preparation. Mix-Muller operates on same cycle, with or without a cooling hood.
- **no excessive power costs.** Mix-Muller uses same HP motor, with or without cooling hood.

These benefits add up to low cost and efficient sand cooling without physical or economical penalty being placed on your sand preparation operations . . . when you choose the *practical* MIX-MULLER/NATIONAL way.





*Name of foundry will be supplied upon request.

F-159

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PRODUCTS OF THE PRACTICAL FOUNDRYMAN

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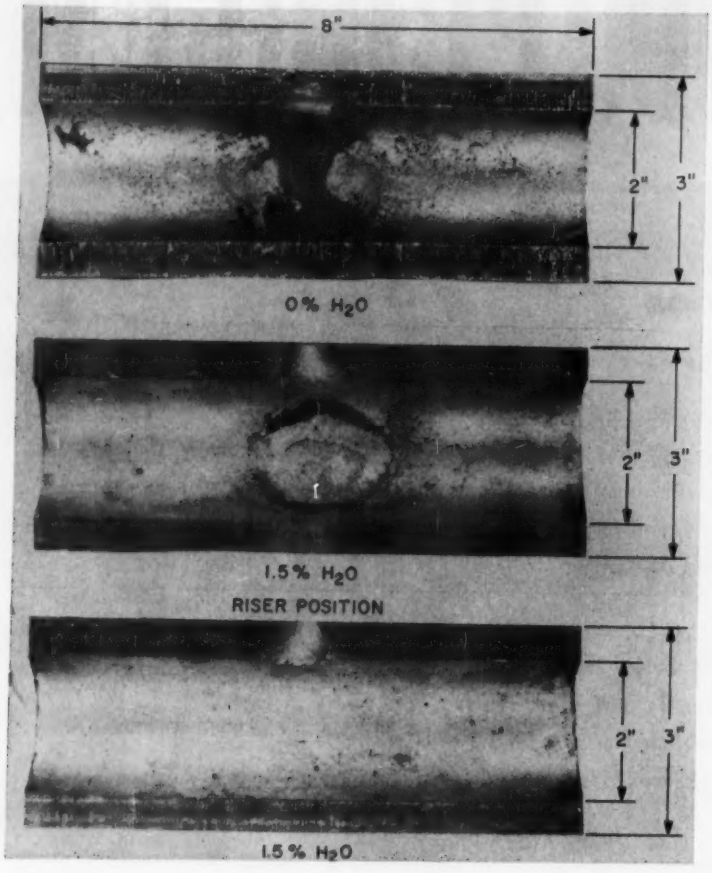


Fig. 8—An illustration of blows resulting from rapid evolution of steam from sodium silicate-bonded cores with insufficient venting and excess water

to the formation of defective castings or castings that require an excessive amount of cleaning time. One of the more prevalent sand failures is metal penetration in cores that are positioned in heavy metal sections.

Tests were conducted to compare the effectiveness of sand additives and a mold wash in combating metal penetration. Sand mixtures containing 10 per cent silica flour, 1 per cent graphite, and 3 per cent seacoal were used. In each case one-half of the core was coated with an alcohol-base silica wash. A fine base sand was used—AFS No. 150—to minimize the effect of pore space inherent to the size of the sand grains, and a 6-in.-diam cylinder of gray cast iron was cast around a 2-in.-diam core in a horizontal position. Sections of the resultant castings are shown in Fig. 7, which illustrates the degree of penetration obtained for each sand mixture.

The most apparent observation in viewing the internal surfaces of the four castings in Fig. 7 is the complete lack of penetration in the core areas coated with the silica wash. The uncoated area of the core containing sodium silicate only (Fig. 7a) was penetrated quite severely. The addition of 10 per cent silica flour (Fig. 7b) decreased the penetration but did not eliminate it, and the 1 per cent addition of graphite (Fig. 7c) also decreased the amount of penetration but did not eliminate it. The uncoated section of the core with 3 per cent seacoal (Fig. 7d), resisted penetration, but a large vein was formed.

Results of these tests would indicate that the best method for protecting sodium-silicate-bonded sand from metal penetration is to coat the mold surface with a wash rather than adding fine material to

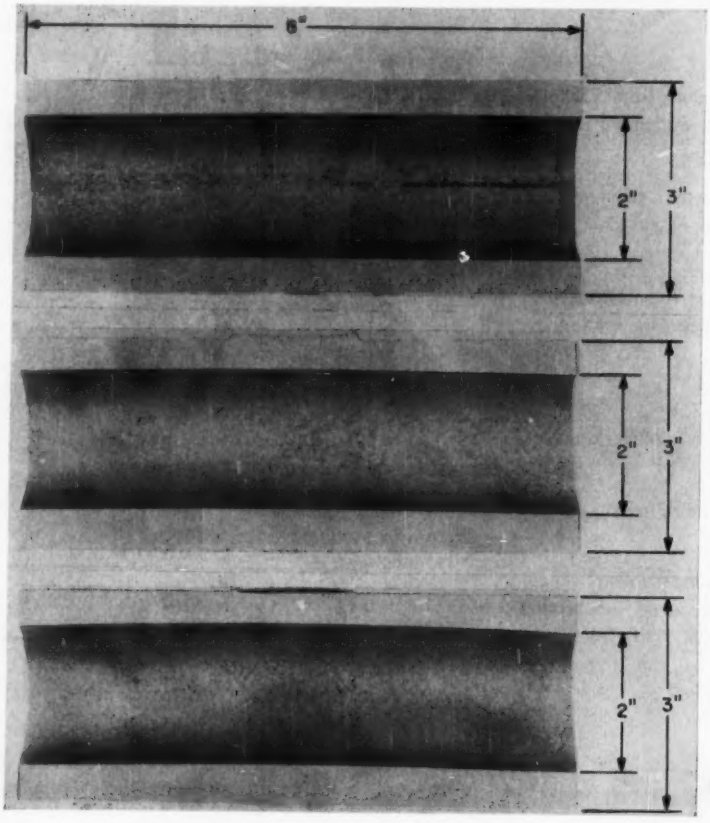
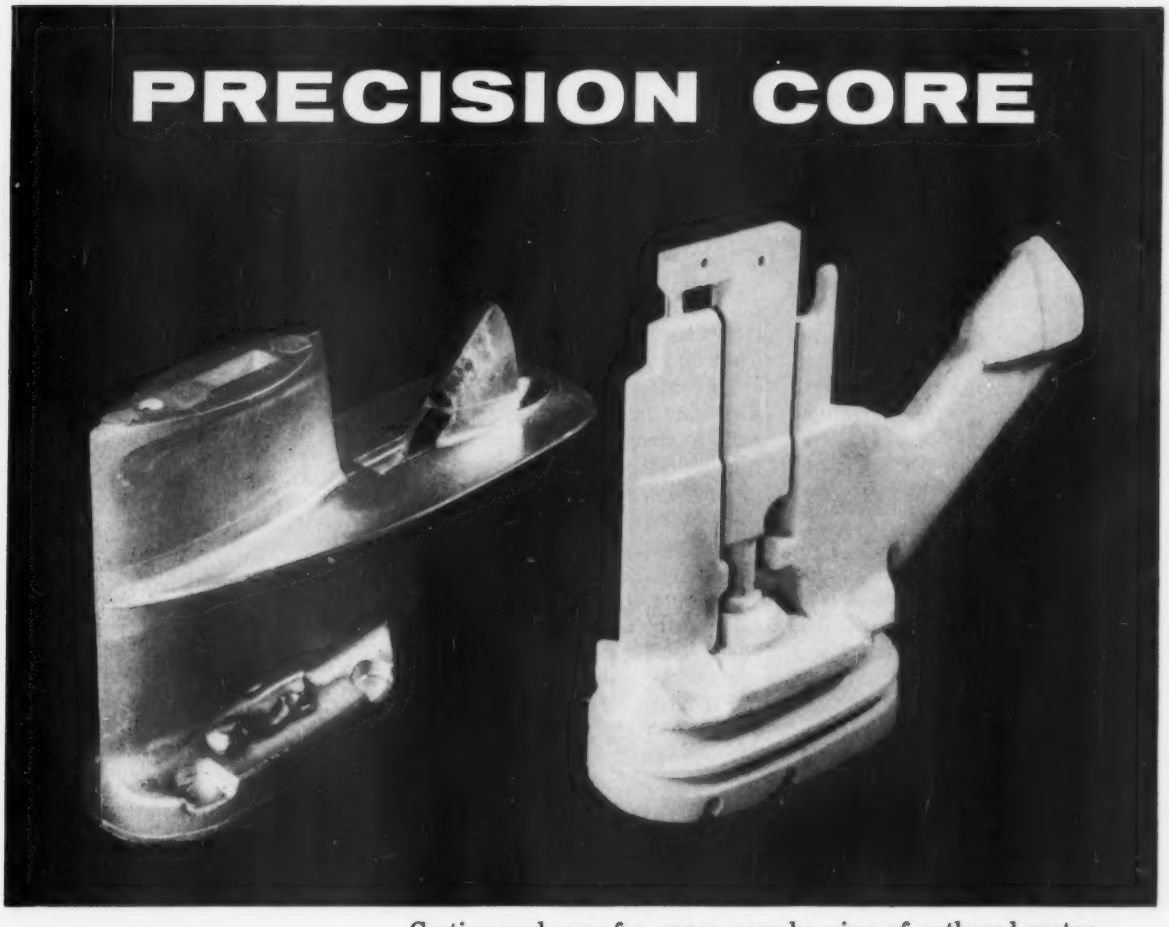


Fig. 9—An illustration of distortion of sodium silicate-bonded cores due to buoyancy in gray iron at 2600° F

PRECISION CORE



Casting and core for upper gear housing of outboard motor.

made with CO_2 in 15 seconds

This intricate *one piece* core was made in 15 seconds with CO_2 — a feat virtually impossible by any other method. That's another example of what CO_2 can do for you!

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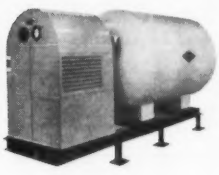

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decrease permeability or increasing the amount of carbonaceous material.

Blows—When molten metal contacts sodium-silicate-bonded sand, the formation of steam is very rapid because the water is released at relatively low temperatures. This rapid formation of steam can cause blows if the sand is not properly vented or if the sand contains an excessive amount of water in addition to the water contained in the sodium-silicate solution. Fig. 8 illustrates several extreme cases of blows. These castings were of aluminum with a wall thickness of ½ in., and the cores were made from sand which was bonded with 5 per cent of sodium silicate.

The top casting had a large void space in the area of the riser, but the molten metal blew completely out of the risers and eroded the sand in the gate area of the other two examples. The cores for the lower two castings contained 1.5 per cent added water and had no center vents, which represented an extreme case; but they do illustrate that sodium-silicate-bonded sand is sensitive to blows, and proper precautions must be taken to keep the water content of the sand as low as possible and to vent the sand properly.

Distortion — Cores made from conventional materials are quite rigid and deform very slightly when heated by molten metal, but cores bonded with sodium silicate can become plastic when heated and an excessive amount of distortion can occur. Distortion of cores due to buoyancy in molten cast iron is illustrated in Fig. 9. Distortion would be expected at temperatures sufficiently high to cause the soda to flux the sand and to increase with increasing amounts of soda. Although hardening sodium silicate with CO_2 does not remove the soda from the sand, a series of experiments were conducted to determine whether the CO_2 reaction affected the distortion tendency.

In Fig. 10 a comparison is made between the strength of the sand after gassing with CO_2 and the increase in diameter of a standard 2 x 2 specimen after heating for 30 minutes at 1800° F. The specimen which was not gassed had only the 1-psi green strength, and it slumped readily under its own weight at 1800° F, causing a 3 per cent increase in diameter. After a 5-second gassing period only a fraction of the potential strength was developed, but the slight hardening was sufficient to cause the distortion to decrease to 0.75 per cent. Longer gassing time did not affect the distortion under these conditions to a notable extent, but an inflection appeared at the same gassing time where the slope of the strength curve decreased sharply.

To clarify the effect of CO_2 gassing time on the tendency of the sand to creep at high temperature, the distortion was amplified by placing a 2-in. cylinder of steel on the sand specimens while they were heated for 30 minutes at 1200°, 1600°, and 1800° F.

The increased distortion of the cylindrical specimens from the added load (Fig. 11) indicated that overgassing with CO_2 can increase the tendency of the sand to creep at temperatures as low as 1200° F. The gassing time period for minimum creep corresponded to the time period where the gassed strength was directly proportional to the gassing time. For low-ratio silicates this gassing period extends to 50 seconds and for high-ratio silicates this gassing period is decreased to 20 seconds.

Since cores can be reinforced by the use of rods or supported by chaplets, the advantages of higher gassed strengths and easier shakeout from longer gassing periods may in many core applications overbalance the advantage of increased creep resistance from short gassing periods. Thus, depending on the requirements of specific applications, process variables such as gassing time which affect a number of sand characteristics must be controlled to develop the most critical properties or the properties that cannot be assisted by other process variables.

Conclusions—Proper selection of materials and processing techniques in the use of sodium-silicate-bonded sands can result in high-quality castings. This selection of materials and techniques sometimes differs from conventional practices but involves control of the same properties and characteristics inherent in any mold or core sand.

A properly balanced selection of sodium-silicate composition, amount of sodium silicate mixed with the sand, CO_2 gassing time, additives such as liquid sugar and other carbonaceous materials, and use of washes, vents, and reinforcement rods guided by the results presented in this report will lead to proper control of green strength, retained strength, metal penetration, gas evolution, and distortion.

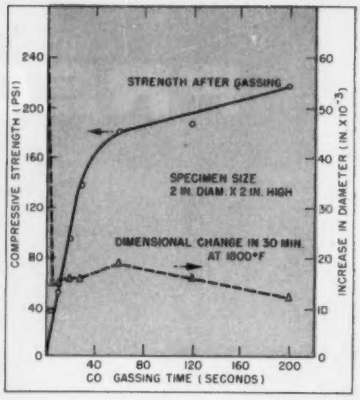

STRENGTH AFTER GASSING
SPECIMEN SIZE
2 IN. DIAM. X 2 IN. HIGH
DIMENSIONAL CHANGE IN 30 MIN. AT 1800°F
COMPRESSIVE STRENGTH (PSI)
INCREASE IN DIAMETER (IN X 10⁻³)
CO GASSING TIME (SECONDS)

Fig. 10—Effect of gassing time on compressive strength and distortion at 1800° F. Sand bonded with 5% sodium silicate. Silica-soda ratio is 2

Acknowledgment—This work is part of a broad investigation of the carbon dioxide (CO_2) process for hardening molds and cores conducted at the request of T. J. Griffin, Code 637, Bureau of Ships, Navy Department.

• **For an extra copy of this article, until supply is exhausted, use card on Page 53**

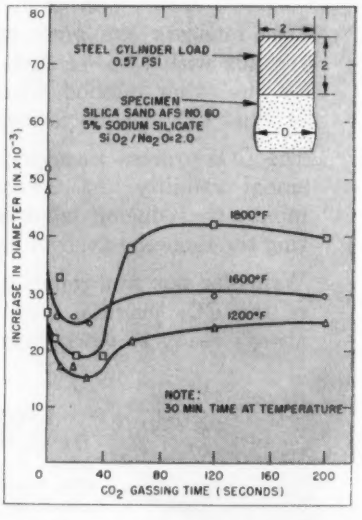
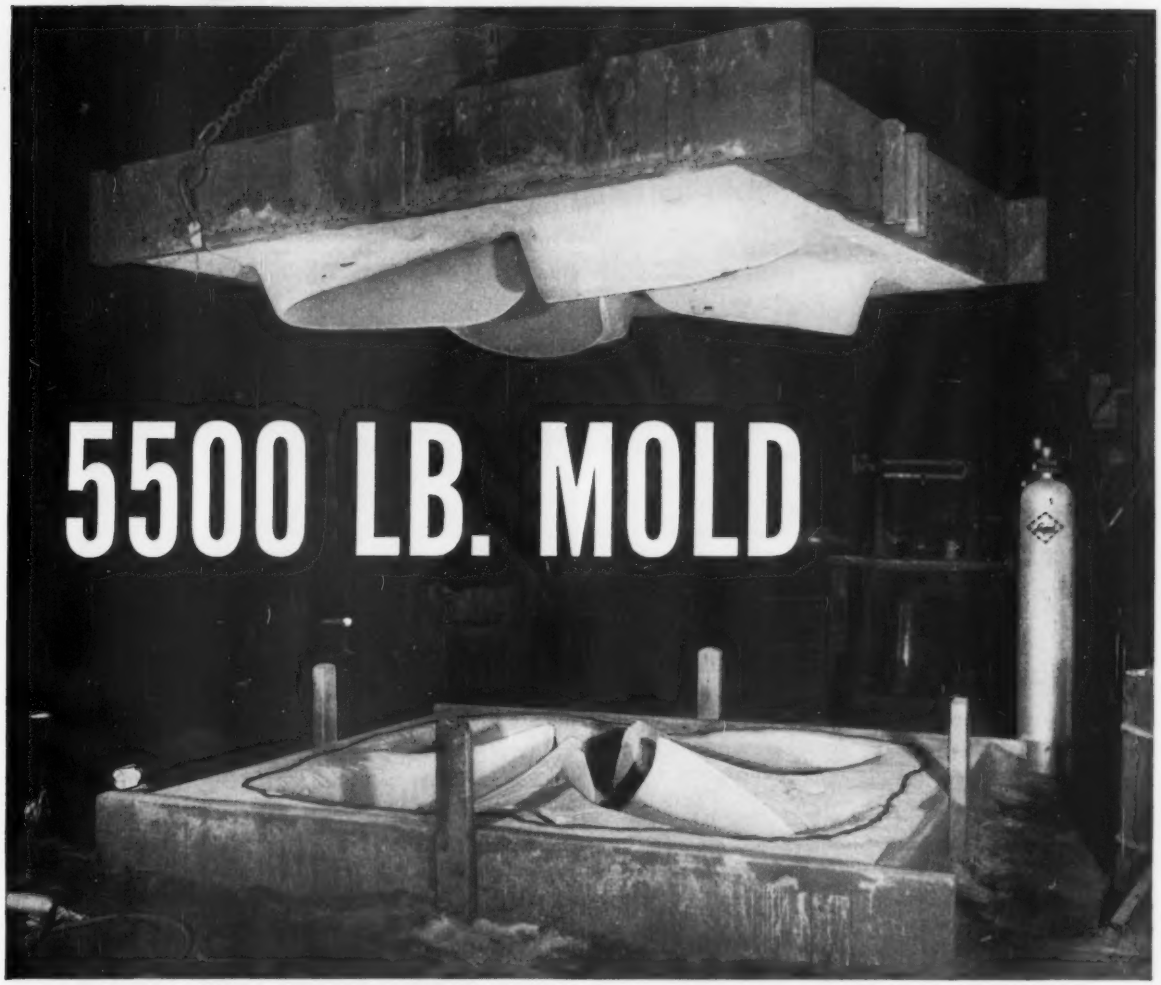


Fig. 11—Effect of gassing time on distortion of sodium silicate-bonded sand at 1200, 1600, and 1800° F

CO_2 CURES



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Costly Copper Components Restored to FULL EFFICIENCY

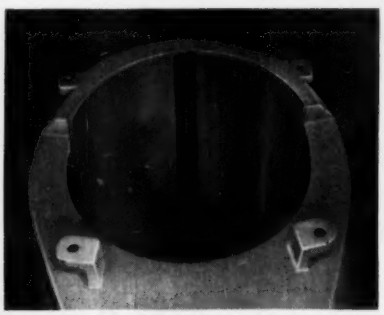
ELECTRODE HOLDERS, BUS TUBES, CABLE CLAMPS RENEWED BY PATENTED PROCESS AT SUBSTANTIAL SAVINGS

A major economic factor in the operating cost of electric arc furnaces is the expense of replacing costly copper components—electrode holders, bus tubes, cable clamps. To *reduce your costs*, Wilson Welding Company has developed an exclusive patented process for rebuilding, renewing and restoring these components to original specifications, to give performance and life expectancy *guaranteed* to equal that of a new unit, *at substantial savings to you.*

Steel plants and foundries throughout the United States and Canada have reduced down time and saved literally thousands of dollars by taking advantage of Wilson Welding Company's exclusive process. In many cases modifications and design changes to customers' requirements have been made.

You will want to know more about Wilson Welding Company's service. A letter or phone call will bring you detailed data promptly.

BEFORE REBUILDING, this electrode holder was badly burned, pitted and scarred, its efficiency impaired, with resulting higher operating costs. Concealed damage, not always apparent, was revealed when rebuilding began. In every case, cooling tubes are checked for leaks, and every rebuilt holder is subjected to thorough inspection and testing.



AFTER REBUILDING, the electrode holder shown at top looked like this. Its performance will be equal to or better than that of a new one. In this case a smooth contact surface was desired, but surfaces can be serrated, dimensions modified, and other design changes incorporated when desired. Work was completed and shipment made within five days after receipt of the damaged holder. Cost of restoring this holder was less than half replacement cost.

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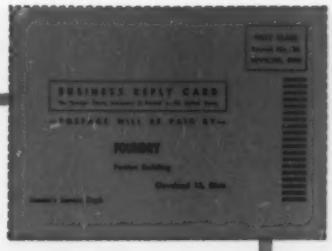
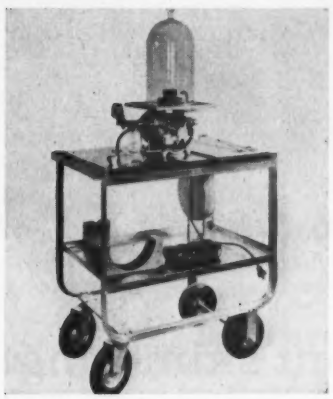


What's New in Equipment and Supplies

CART-MOUNTED GAS DETECTOR

Portable version of the Exomet Speedy gas detector for vacuum testing molten aluminum is mounted on a rubber-tired, stainless steel cart with a formica top. The unit is



complete with vacuum pump, bell jar, sample cups, and a reel with a 50-ft retractable extension cord.

The unit is moved to the place where the sample is to be secured, and a small test casting is covered with the bell jar, which is evacuated to −27 in. of mercury. Mushrooming of the sample surface during freezing, or failure to shrink normally, indicates gas. The sample can be sectioned for evaluation of results. — **Harry W. Dietert Co.**, 9330 Roselawn Ave., Detroit 4, Mich.

For More Details Circle No. 450—Page 53

HEAT-RESISTANT PAINT

Improvements in the formulation of Heat-Rem H-170 heat resistant aluminum paint are claimed to cause greater adhesion, increased brightness, and longer life. These qualities are the results of a suspended combination of "nonleafing" and "leafing" aluminum in the paint compound. "Nonleafing" particles help to form a protective coating capable of withstanding temperatures to 1700° F. They are said to remain equally distributed throughout the vehicle and to provide uniform coverage of aluminum in the applied paint coat. The "leafing" aluminum is stated to rise to the surface on application and to form a bright, elastic finish that is resistant to moisture, corrosion, mild acids, alkalies, and other industrial fumes.

This high heat paint air dries at normal temperatures. Other H-170 extra-high-heat paints are offered in metallic red, blue, and gold as well as in special colors.—**Speco Inc.**, 7308 Associate Ave., Cleveland 9, Ohio.

For More Details Circle No. 451—Page 53

NODULAR IRON ADDITIVE

Plunging technique for production of nodular (ductile) iron uses a refractory basket which contains the magnesium additive. The basket is plunged into a ladle full of iron. Results are said to include lower treatment cost, cleaner iron, and elimination of flame and smoke during alloying.

Package designed for this method of treatment provides a specific weight of alloy for treatment of varying ladle sizes. It eliminates weighing and requires a minimum of handling in the foundry. The canned Sil-Mag alloys are available in disposable pallet crates.—**Ohio Ferro-Alloys Corp.**, Canton, Ohio.

For More Details Circle No. 452—Page 53

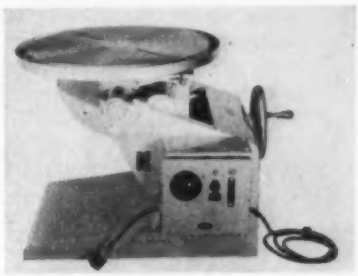
PNEUMATIC MUFFLERS

New model of the Atomuffler pneumatic muffler incorporates an improved internal resonator that gives more efficient silencing of noise caused by air-operated equipment. As speeding air leaves a machine's exhaust port, the muffler's internal deflector breaks up the air jet. Scattered air waves are reflected parabolically into opposing high-velocity forces, collision of which cancels rushing air before it becomes noise. This cancellation principle enables the device to diffuse escaping air at a 60-to-1 ratio.—**Allied Witan Co.**, 12500 Bellaire Rd., Cleveland 35, Ohio.

For More Details Circle No. 453—Page 53

TURNTABLE POSITIONER

Load capacity of turntable welding positioner is 500 lb at center of gravity 6 in. above the table surface and 3 in. off center of rotation. In-



definite speed range is available from ¼ to 5 rpm. A heavy duty, 110-v, direct current, shunt-type motor is used in conjunction with a two-speed reduction gearbox. Table speed is constant, and direction of rotation is reversible.

The table can be made to freewheel by placing the speed selector

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Whiting Ladles of all types and sizes are designed to speed output, minimize labor and improve quality of foundry castings. Built to withstand the rigors of year in, year out service, they feature steel spouts, riveted or welded heads and specially designed bowl reinforcement.

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in neutral position. Table top is removable and can be tilted to as much as 135 degrees while loaded. A limit switch provides down limit protection when the tilt mechanism is motorized. Diameter of tabletop is 26 in.—**Miami Specialties Co.**, Troy, Ohio.

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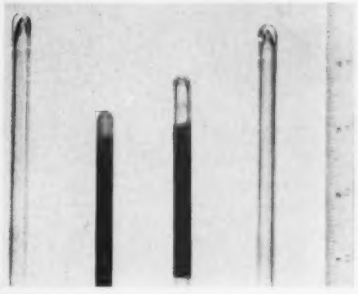
IMMERSION THERMOCOUPLES

Immersion thermocouple tubes are completely transparent from end to end. This feature permits



users to emplace them accurately in the platinum tips of the heat-measuring devices before their insertion in molten metal.

These tubes are made of clear quartz and have outside diameters of 7½ to 8 mm. Their lengths are specified by users. Used for single immersions, they are produced in large numbers and are impervious to temperatures well above 2500° F. —**Charles Engelhard Inc.**, 850 Passaic Ave., East Newark, N. J.

For More Details Circle No. 455—Page 53

COMBUSTION ANALYSES

Tin capsule for combustion analyses will handle both organic and

inorganic samples in either powder or liquid form and can be used for carbon, sulfur, oxygen, hydrogen, and other analyses.

For powdered samples such as tungsten, tantalum, and coal, the analyst determines the tare weight of the capsule, adds the sample, folds over the end, and reweighs to determine sample weight. This procedure eliminates possible loss of the sample in transfer from balance to combustion unit.

Liquid samples are handled in exactly the same fashion as powdered. This method eliminates possible loss of the sample through volatilization while it is on the balance pan.—**Laboratory Equipment Corp.**, St. Joseph, Mich.

For More Details Circle No. 456—Page 53

LIQUID ALUMINUM

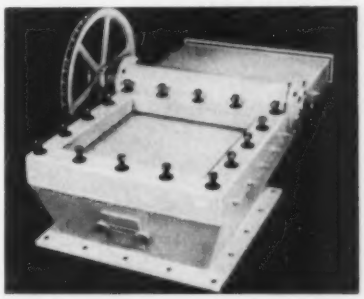
Devcon F-2 is a liquid aluminum material that can be cast without heat or pressure. Similar to the company's aluminum putty, it becomes liquid on addition of the hardening agent. Two hours after the hardener has been added, it becomes a tough, durable, metallic mass similar in appearance to aluminum or steel.

It is said to have excellent physical properties (compression strength is 20,000 psi) and is unaffected by most oils, chemicals, and solvents. It bonds aluminum, steel, bronze, wood, ceramic, and many other materials to itself or to each other. It is nonshrinking and nonexpanding, has good abrasion resistance, and can be drilled, tapped, or otherwise machined. This material is available in 1, 4, and 15-lb units.—**Devcon Corp.**, Danvers, Mass.

For More Details Circle No. 457—Page 53

SHUTOFF GATES

Dust-tight, self-cleaning double rack and pinion shutoff gates are said to provide troublefree operation with a variety of materials. The gate plate is renewable with



material in the field without replacement of racks.

Standard features of the 12, 14, 16, 18, 20, 24, and 30-in. gates include deep, U-section gate plate assembly; open-toothed, corrosion-resistant aluminum alloy racks; self-cleaning cast iron pinions; lapped seal on all four sides of gate plate;

Unit is Automatic Coreshooter and CO_2-Gasser

Combined automatic coreshooter and CO_2-gasser with three-station turntable is designed to shoot, gas, and strip cores on a 5 to 8-second cycle. Unit is available with turntable diameter of either 24 or 42 in., for production of cores weighing up to 5 or 8½ lb, respectively.

Either fully automatic or semiautomatic operation can be selected. In fully automatic operation, cores are produced continuously.

As the operator is removing one core, a second is being shot, and a third is being gassed. In semiautomatic operation, only one core is produced per cycle.

The rotary table is equipped with three clamping and stripping fixtures to which the side portions of vertically divided coreboxes are fixed. These side parts are withdrawn automatically so

that the operator simply takes away the stripped cores.—**Hansberg Shooters Inc.**, 3213 Central St., Evanston, Ill.

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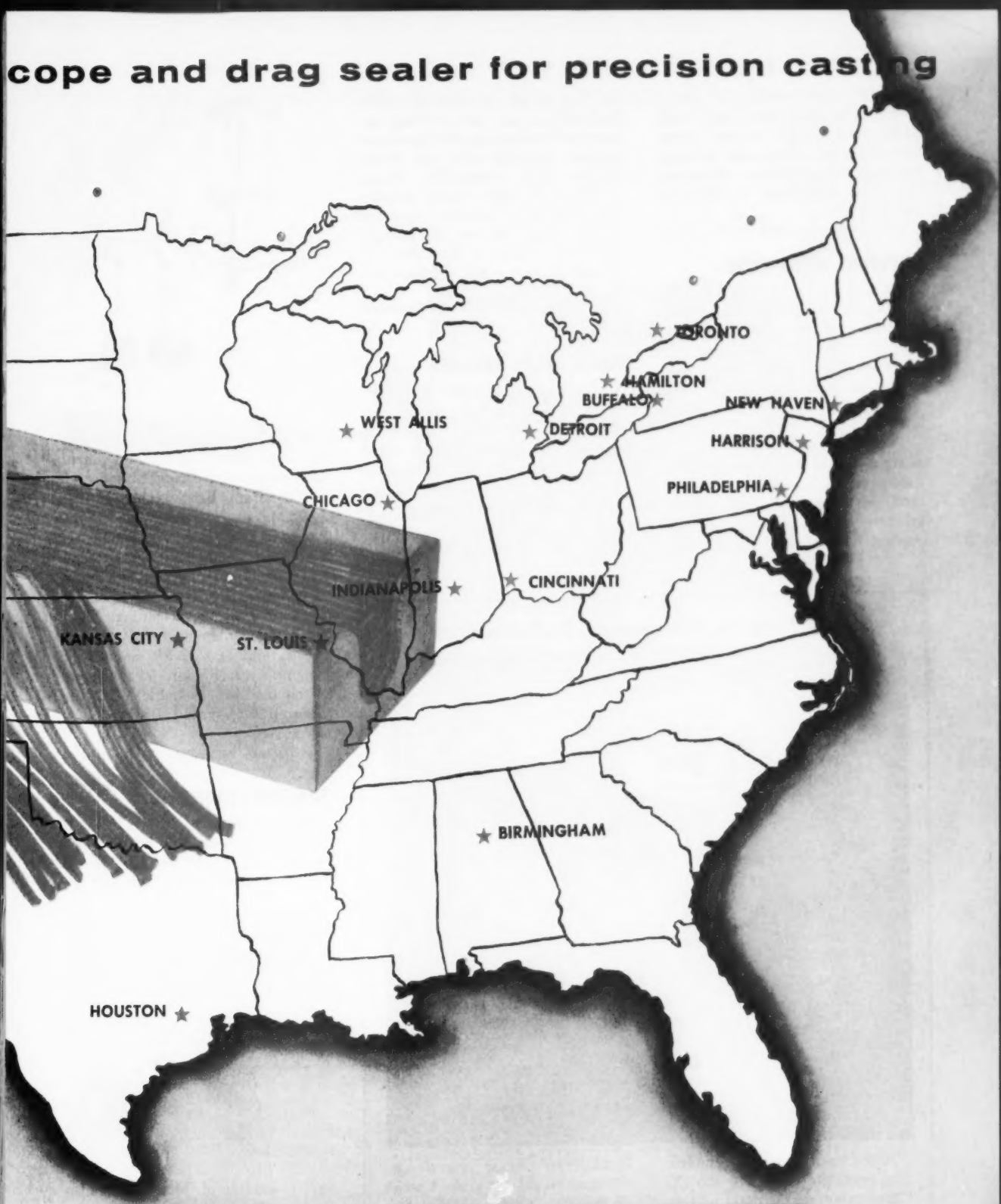

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gasketed cast aluminum access doors; 3/8-in. steel plate body with 3/4-in. thick flanges, external grease fittings for all rollers and bearings, and many other points.—**Beaumont Birch Co.**, 1505 Race St., Philadelphia 2, Pa.

For More Details Circle No. 458—Page 53

GRINDING WHEEL BOND

V9 Bond is a vitrified bond for silicon carbide abrasive grinding wheels. It is described as a chemically designed glass bond that produces a grinding wheel with a more nearly uniform, fast-cutting action which is reproducible from job to job.

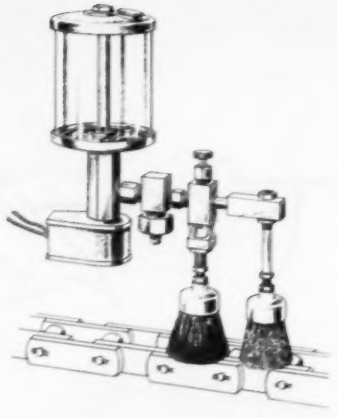
This new bond has been adopted as standard for the company's Electrolon vitrified bonded wheels as used on floor stand and portable grinders in speed ranges not exceeding 6500 sfpm. These wheels are best suited for grinding materials such as gray iron castings, unannealed malleables, and brass and bronze. Popular sizes and shapes include larger wheels for offhand snagging on floor stand grinders and a variety of abrasive cones and similar shapes for use on portable machines.—**Simonds Abrasive Co.**, Tacony & Fraley Sts., Philadelphia 37, Pa.

For More Details Circle No. 459—Page 53

CHAIN OILER BRUSHES

Chain cleaners which use stainless steel brushes are said to clean chains automatically, without removal. A stainless steel shank brush precedes the lubricating brush, wipes the chain clean, and is followed by application of a protective coat of oil.

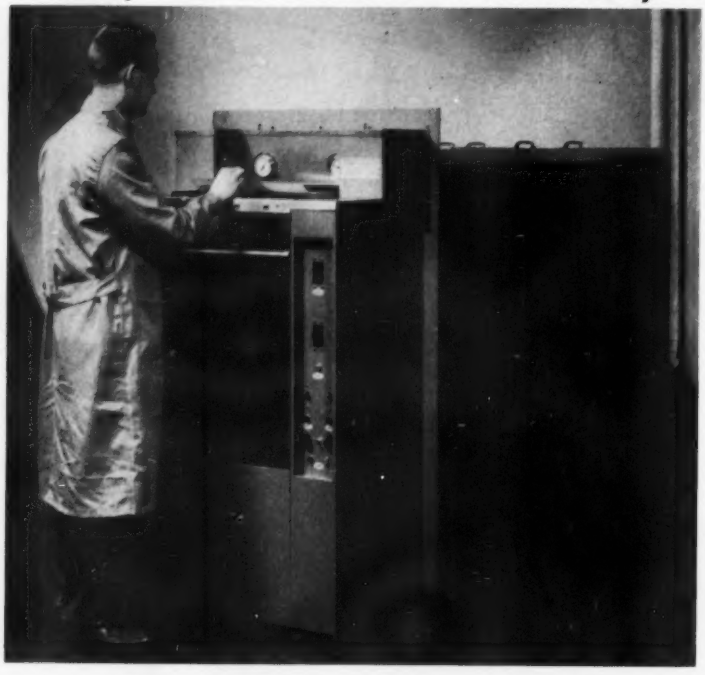
New line of brushes incorporates



a mechanical bond on the bristles which provides a secure attachment and improves wearing qualities of the brushes. Bristle materials are available in horsehair for normal lubricating applications, nylon for high-speed chains for which greater wear resistance is desired, and stainless steel for high-temperature lubrication and chain cleaning. They are made in diameters of 5/8, 1, and 1 1/2 in. and in 3/8 x 2 1/4-in. widths. Cleaning attachments for all types of chains are available.—**Oil-Rite Corp.**, 2387 Waldo Blvd., Manitowoc, Wis.

For More Details Circle No. 460—Page 53

X-Ray Film Is Processed Automatically



Automatic processing of industrial radiographs with the X-Omat processor permits delivery of a dry film in 13 minutes, the company states. A prototype installation is said to have cut radiographic costs in half.

The unit is self-threading and accepts continuous lengths of roll x-ray film up to 17 in. wide. It also can process several narrower strips side by side. A series of precision rollers conveys film through the processing cycle. The machine handles all listed sheet sizes of the company's types AA and M x-ray film.—**X-Ray Div., Eastman Kodak Co.**, Rochester 4, N. Y.

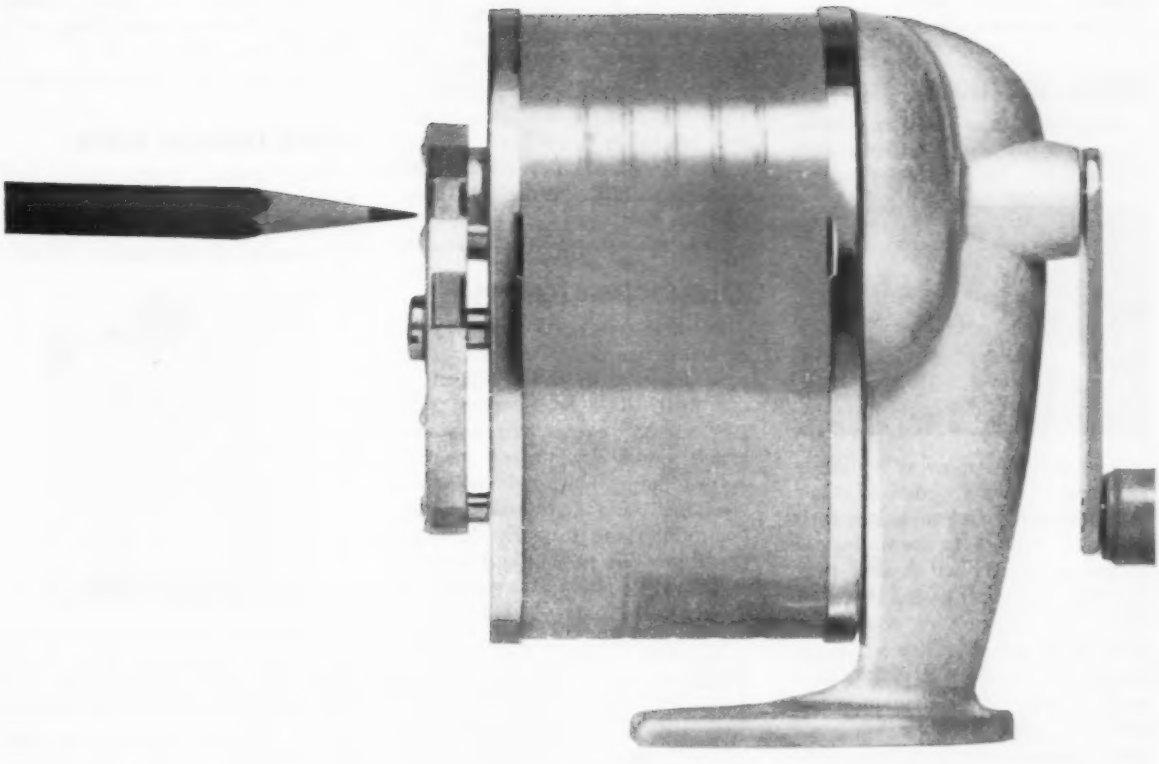
For More Details Circle No. 480—Page 53

TRACTOR LOADER

Davis 99 economy tractor loader is designed for users who do not need deluxe models. It is available for the M-F Work Bull 202 and all

utility models of Massey-Ferguson or Ferguson tractors as well as for those of a number of other manufacturers. Said to be built 15 per cent stronger than previous models, it has a capacity of 2000 lb at half height and 1500 at full height.

Lift arms and main frame have the line's standard box-frame construction. Breakaway power of the



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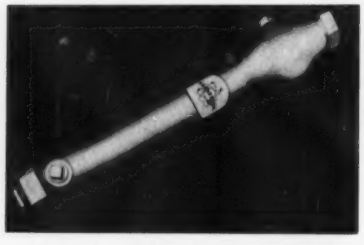
Circle 662 on Page 53

lift arms is 2500 lb. The loader has a 10-gpm pump and an operating pressure of 2150 psi. The single dump cylinder is double-acting, with hydraulic pressure both ways. The bucket has a 10 ft 2 in. clearance and will reach a maximum of 56 in. in front of the tractor.—**Massey-Ferguson Industrial Div.**, 1009 S. West St., Wichita, Kans.

For More Details Circle No. 461—Page 53

WATER CONDITIONER

Magnetron is a water conditioning instrument which prevents scale and corrosion by introducing energy



to the salt and mineral molecules in water. For a period of time, these energized molecules lose their ability to adhere to themselves or to the metal over which they pass. No chemicals of any kind are used, and the unit functions equally efficiently in soft, hard, or sea water systems. In addition, it removes existing scale and corrosion. The device is guaranteed for ten years and requires only periodic visual inspection.—**Magnetron Water Conditioner N. Y. Inc.**, 100 N. Village Ave., Rockville Centre, N. Y.

For More Details Circle No. 462—Page 53

SPEED REDUCER

Shaftex speed reducer, a completely enclosed unit for direct mounting on the driven shaft, is available in single or double reduction units in sizes up to 40 hp with nominal internal gear ratios of 5 to 1, 15 to 1, and 20 to 1. It can be adapted easily, without disassembly, to include backstops where reverse rotation is prohibited and overload release for chokable conditions.

These reducers usually are driven by a fixed-pitch diameter Texrope drive. Variable speeds can be obtained by use of either stationary control or motion control Vari-Pitch sheaves. — **Allis Chalmers Mfg. Co.**, Milwaukee 1, Wis.

For More Details Circle No. 463—Page 53

SPHERICAL ROLLER BEARINGS

Line of self-aligning spherical roller bearings includes these features: 1. Maximum diameter and quantity of convex rollers for each bearing size. 2. Precision machined, centrifugally cast bronze retainers. 3. High, heavy inner race shoulders.

These bearings are being introduced initially in bore sizes ranging from 1.5749 to 11.0236 in. with dynamic load ratings to 288,000 lb. They also will be available in pillow blocks in bore sizes ranging from 1 7/16 to 10 in.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 464—Page 53

HAND-CUTTING TORCHES

Injection-type hand-cutting torches are designed for use with propane and natural gases. Known as the Airco 2000 Series, they have an "ease-on" cutting oxygen valve which allows smooth and gradual oxygen flow. The torch head is a machined silicon bronze forging. For rigidity and strength, the brass gas tubes are in a triangular arrangement. The mixer housing is a machined brass forging fed by two short tubes, one for fuel gas

and the other for preheat oxygen. The rear end is a brass forging. Inlet connections will accommodate 1/4, 5/16, or 3/8-in. hose.—**Air Reduction Sales Co.**, a division of Air Reduction Co., 150 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 465—Page 53

CRUCIBLE LIFTING TONGS

Lifting tongs and shank are said to eliminate dangerous spills from broken crucibles and to prolong crucible life. They grasp the crucible around the base, thereby preventing bottom failure if a crack occurs. The tongs do not subject crucibles to the strains imposed by center lifts. Crucibles reportedly can be used after they wear thin, so that up to 25 per cent more heats can be run safely in a crucible. The pouring shank fits the base of the crucible so that the load is borne from the bottom. A clamp is provided with the shank to hold the crucible firmly in place during pouring.—**Inductotherm Corp.**, 412 Illinois Ave., Delanco, N. J.

For More Details Circle No. 466—Page 53

BARREL FINISHING MEDIA

Discoloration, impingement, and media fracture in barrel finishing are said to be virtually eliminated by a media of new shape. Honite

C-R tumbling shapes are truncated, triangular pyramids with sharp edges and acute angles which work into radiuses ordinarily difficult to reach. The new shape is composed of aluminum oxide mineral anchored in a binder developed by the company and is said to cut up to 2 1/2 times faster than existing aluminum oxide chips and as much as 12 times faster than natural stone media. Because of its speed and cutting action, the media is intended for stock removal. It is not affected by acids or alkalies normally found in finishing compounds. — **Minnesota Mining & Mfg. Co.**, 900 Bush Ave., St. Paul 6, Minn.

For More Details Circle No. 467—Page 53

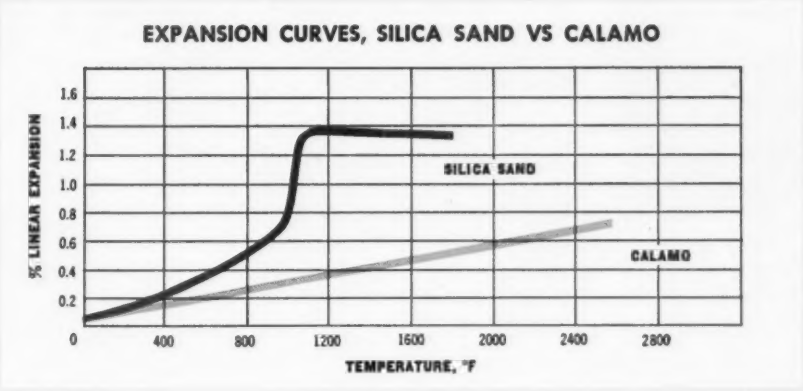
PACKAGED SILICON CARBIDE

Carbo-Sil No. 4, the company's silicon carbide addition for gray and malleable iron cupolas now is available in 10 and 15-lb units in lacquered steel containers with locked, unsoldered seams. It is claimed that every pound of the precrushed material is protected until it has reached the significant melting zone of the cupola, at

Harbison-Walker

REFRACTORY MOLD MATERIALS

for metal casting



Calamo for Investment Molds

CALAMO, one of the extensively used Harbison-Walker products for molding is an alumina-silica refractory of optimum sizings for various molding mixtures. Its fusion point is 100°F. higher than that of normal silica sand mixes.

The chart above shows the exceedingly desirable expansion curve of CALAMO as compared with that of silica sand.

CALAMO, used as the major constituent of precision casting investment mixes, improves the dimensional constancy of the molds, makes them stronger and more resistant to erosion by metal flow. Investment costs are measurably reduced because an appreciably lesser amount of bonding agent is needed. This is attributable to the very desirable particle sizing and the equiaxed, dense grains of CALAMO.

CALAMO, used alone or as the major part of conventional dry sand molding mixes in rammed or in slinger-placed sand molds, provides not only the very desirable low thermal expansion characteristics particularly suited for precision casting but also provides the required refractoriness for metals and alloys which are melted at unusually high temperatures.

H-W Forsterite Grains for Shell Molds

Forsterite grain is highly refractory magnesium silicate possessing physical properties which make it especially suited for resin-bonded shell molding. Its specific heat, thermal conductivity, high temperature stability and uniform thermal expansion —all contribute to its excellent performance.

As the result of the optimum chilling effect of forsterite grain, sufficient strength develops in the skin of the steel casting to resist outside gas pressure as well as inside ferrostatic pressure, and a smooth casting surface is assured.

H-W FORSTERITE GRAINS are supplied in controlled sizings best suited for securing the most satisfactory shell molded casting surfaces.

H-W FORSTERITE FLOUR is furnished for use as an additive to the H-W FORSTERITE GRAINS and resin mix to provide for ultimate in surface smoothness, particularly of castings with heavy sections.

Write us for information regarding these and other Harbison-Walker products — mold wash materials — ceramic molding media — mold sand bonding clays.

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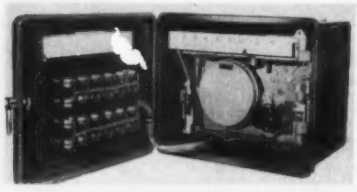
which point it reacts completely and goes into solution. There are no heavy, undissolved pieces in the drop, and no fine pieces are blown out the stack. The packaged material is shipped in palletized, waterproofed, and top-strapped units.—**American Metallurgical Products Co.**, 3601 Forbes Ave., Pittsburgh 13, Pa.

For More Details Circle No. 468—Page 53

TEMPERATURE INDICATOR

For rapid checking of temperatures at many points, the 9000



Series Multi-Switch indicator is available with switching details that permit it to be used for as many as 108 stations. More stations can be added by use of another switch housing cabinet. The basic instrument is a self-contained, null-balance unit which requires only the external sensing devices. Selector switches are three-position, spring-return type. Reference junction compensation is automatic. The standard reference system is a constant voltage source with standard cell and battery optional. Accuracy is plus or minus $\frac{1}{4}$ of 1 per cent for all scale spans in the pyrometric range.—**Wheelco Instruments Div.**, Barber-Colman Co., Rockford, Ill.

For More Details Circle No. 469—Page 53

FLAT-FLAME BURNER

Flat flame is produced by new burner that distributes heat uniformly at right angles to burner centerline. It heats a large area of the furnace wall behind the burner without the aid of impingement baffles or any other high-maintenance heat distribution device. No metal parts within the burner tile are exposed to excessive heat.

The burner is a nozzle-mix type offered in six sizes with air connections ranging from $1\frac{1}{4}$ to 4-in. pipe size. It operates on 12 to 16 osi air pressure at high fire with capacities of 234,000 to 2,620,000 Btu per hr at 16 osi.—**North American Mfg. Co.**, 4455 E. 71st St., Cleveland 5, Ohio.

For More Details Circle No. 470—Page 53

AIR HOISTS

Master Power air hoists are said to offer speed control, economy, compactness, light weight, low maintenance, and safe operation. They permit variable precision load spotting with air or manual control from creep to top speed. Overloads only slow or stall the motor,

without damage or harm to the hoist. Continuous operation at maximum speed and load will not cause overheating. The aluminum alloy frame and housing has strength four times greater than maximum load requirements. Hoists are enclosed to seal out dirt and corrosion and are muffled for quiet operation. Motors are explosion-proof. Loads lower safely in the event of either air supply or brake failure. — **Master Pneumatic Tool Co.**, Bedford, Ohio.

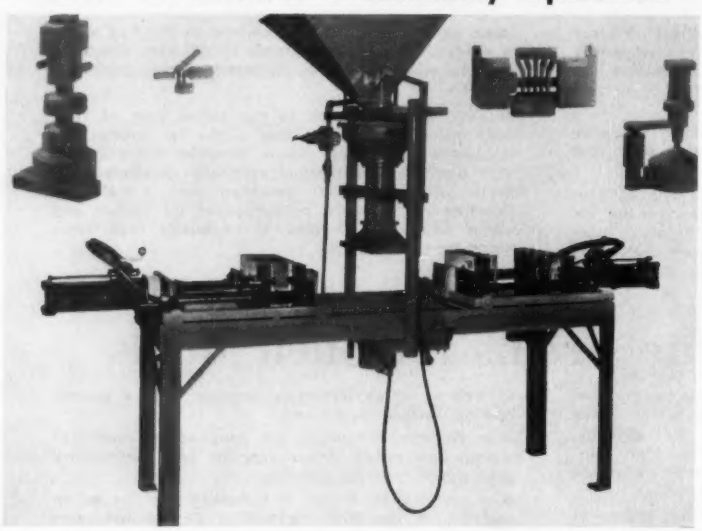
For More Details Circle No. 471—Page 53

DYNAMOMETERS

Hydroway dynamometers are reported to be portable, compact, and ruggedly built. Over-all length is 13 in., and weight is 15 lb. Capacity is 0-5000 lb, with a built-in 5 to 1 safety factor. Maximum movement of the piston, under full load, is 0.032 in.

Body of the unit is seamless steel

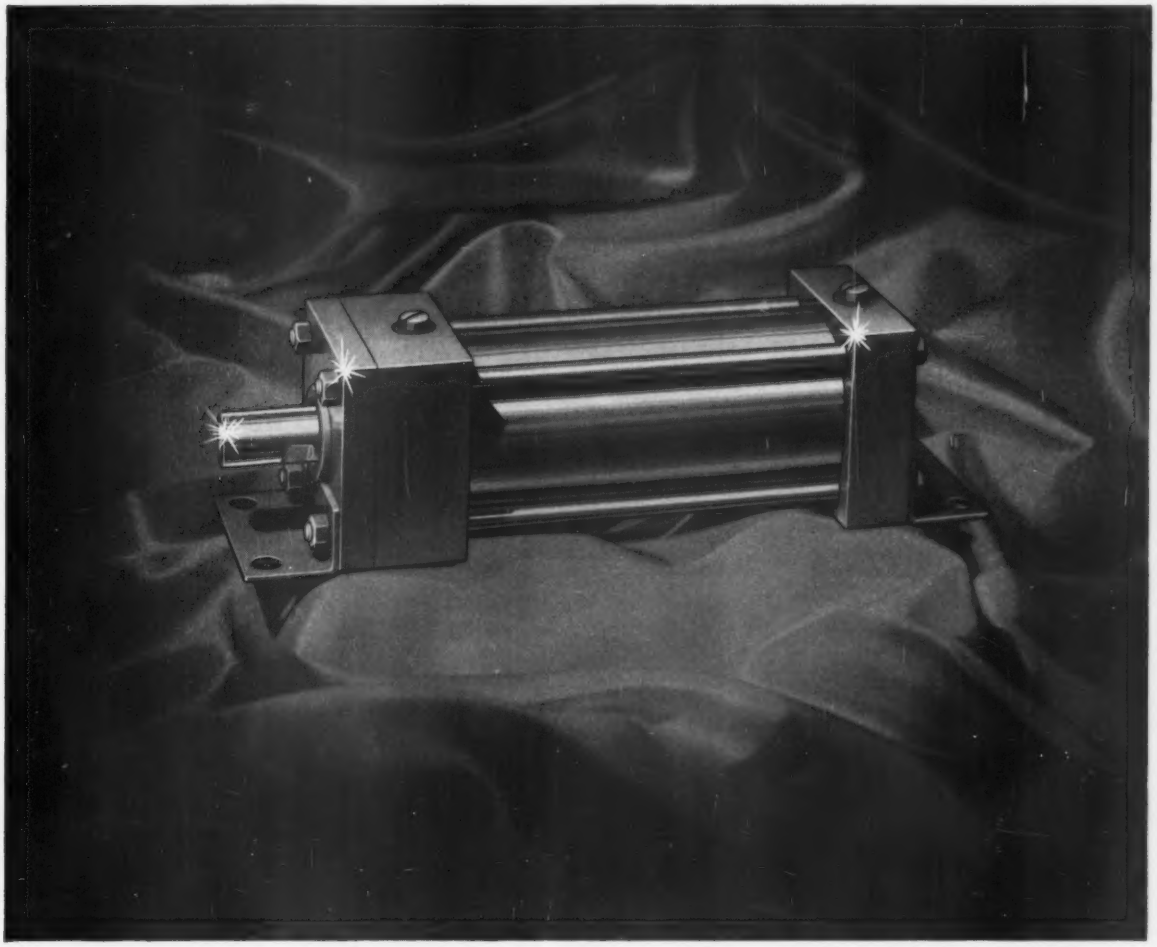
Shell Coreblower is Manually Operated



The 300-H Cor-Blo is a two-station, shuttle-type, low-pressure shell coreblower. Manually operated, it produces shell cores up to 10 in. in diam and 12 in. high. Draw is 6 in., and opening between heater plates is 10 in. The self-feeder has a capacity of 200 lb of resin-coated sand.

Each station is center pivoted for rollover action. Unit is powered by air cylinders, and an air regulator selects correct blowing pressures for cores of different sizes. Manufacturer claims that many existing aluminum coreboxes can be converted for use with this machine.—**Harrison Machine Co.**, Wesleyville, Erie, Pa.

For More Details Circle No. 481—Page 53



Illustrated—Logansquare Cylinder Meets J.I.C. Standards

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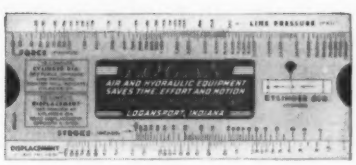

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- ☐ 200-1 HYD. POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
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Circle 664 on Page 53

tubing, and all internal parts are steel. The dial housing is a high-strength aluminum alloy casting. Load connectors are high-carbon, drop-forged steel. Dial face is 6 in. in diam and is white with black figures. Minimum dial graduation is 25 lb. These instruments are permanently sealed and require no fluid or oiling. — **Hydroway Scales Inc.**, P. O. Box 531, Oakridge Station, Royal Oak, Mich.

For More Details Circle No. 472—Page 53

LP-FUELED PLATFORM TRUCK

Prime-Mover model F-40 platform truck now is available with an LP gas fuel system. The system includes an 18-hp engine equipped for LP gas operation, an LP gas tank equipped with a solenoid fuel shutoff safety valve which functions automatically if the engine stalls, and an excess-flow check valve which stops fuel flow if a fuel line breaks. Either fixed or removable 33½-lb capacity tanks can be furnished. An LP gas fuel system is said to increase engine life, decrease oil consumption, and reduce noxious fumes and maintenance. The truck has a capacity of 4000 lb and features a hydraulic torque converter drive and a spinproof differential.— **Prime-Mover Co.**, Muscatine, Iowa.

For More Details Circle No. 473—Page 53

COMBUSTION TUBE FURNACES

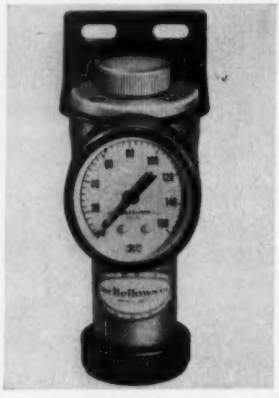
Improved and redesigned combustion tube furnaces are said to meet the requirements of all com-

bustion tube methods of carbon and sulfur analysis on ferrous, nonferrous, and petroleum samples. They provide low-cost, dependable operation at continuous temperatures to 2650° F. These furnaces are available in one-tube and two-tube models and are adaptable to 1, 1¼, and 1½-in. combustion tubes. — **Lindberg Engineering Co., Laboratory Equipment Div.**, 2444 W. Hubbard St., Chicago 12, Ill.

For More Details Circle No. 474—Page 53

AIR LINE REGULATORS

Relieving-type air line regulators have been added to the company's line of Controlled-Air-Power devices. A built-in pressure relief valve allows increases in down-



stream pressure to bleed harmlessly into the atmosphere when such pressure exceeds the regulator setting. Adjustment of the regulator knob to the desired pressure setting is all that is required.

These regulators reduce primary line operating pressures up to 250 psi and maintain desired downstream pressures of 0 to 50 psi, 0 to 125 psi, and 0 to 250 psi, obtainable from separate units. Both wall or through-panel mounting brackets are available, and the regulators also are obtainable with or without gages. — **Bellows Co.**, Akron 9, Ohio.

For More Details Circle No. 475—Page 53

PLUNGER LUBRICANTS

Dylube 400 series of plunger lubricants for cold chamber diecasting is said to reduce shot-sleeve replacement problems 75 per cent. Melt, flash boil, and end points of the lubricants are in excess of the temperature of the molten metal as it enters the shot well.

Available in pigmented and nonpigmented formulations, these products are claimed to possess a combination of tenacious adhesion, wettability, and extreme pressure characteristics. They are reported to eliminate flashback of metal over the plunger, oil spatter on castings, and dripping of lubricant from plunger to the equipment bed.— **American Charcoal Co.**, 201 S. Green St., Detroit 17, Mich.

For More Details Circle No. 476—Page 53

V-BELT DRIVES

Super HC V-belt reportedly makes it possible to reduce cost of a drive as much as 20 per cent. It features reductions in width of belts and sheaves, in sheave diameters, in center distances, and in over-all costs. Smaller housings, bases, and other components can be used.

It is claimed that the belt provides complete coverage of the entire range of drive requirements with only three cross sections. High-performance materials supply such additional horsepower capacity that cross-section dimensions could be made nearly 50 per cent smaller. The arched top of the belt prevents distortion of the tensile section, and improved concave sidewalls eliminate concentrated wear on the sides of the belt.—**Gates Rubber Co.**, 999 Broadway, Denver 17, Colo.

For More Details Circle No. 477—Page 53

HYDRAULIC CRANE

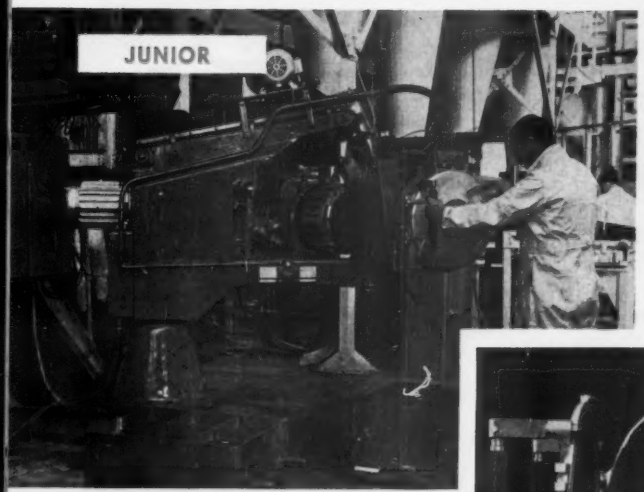
Diesel hydraulic locomotive crane called the Hydra Orton eliminates all open gearing, shafts, shaft bearings, and clutches. This design is

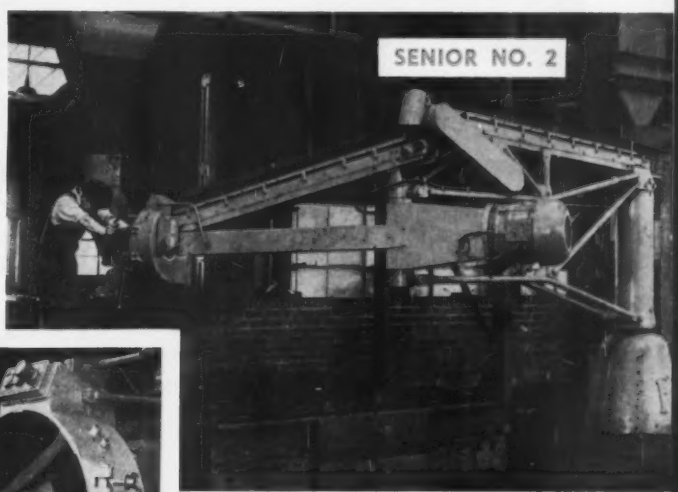
claimed to eliminate all major sources of maintenance. In addition, operation is smooth and quiet. Power costs and friction losses are held to a minimum, and overload damage is preventd. The crane is available in nine sizes. — **Orton Crane & Shovel Co.**, 608 S. Dearborn St., Chicago 5, Ill.

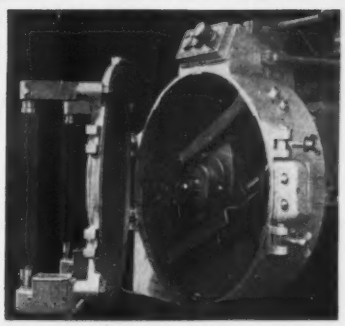
For More Details Circle No. 478—Page 53

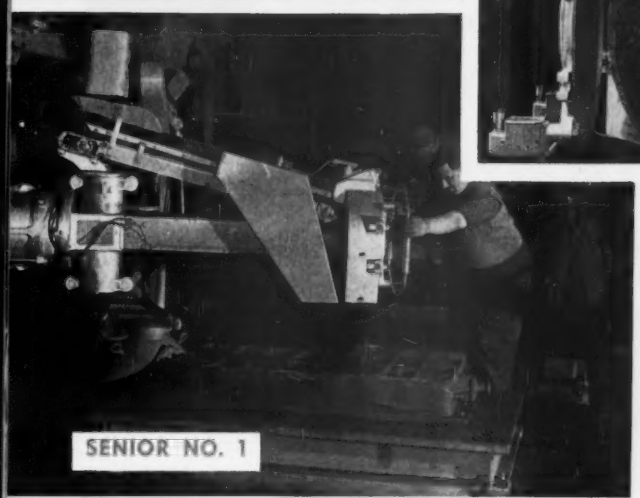
F. E. SANDRAMMERS

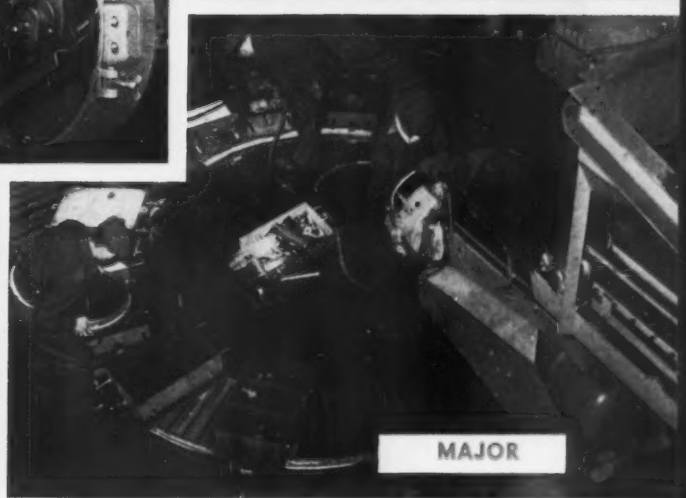
USED ALL OVER THE WORLD











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Circle 665 on Page 53

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Circle 666 on Page 53

View shows some of the more than 100 foundrymen who attended the Fourth Annual Technical and Operating Conference of the Malleable Founders' Society Feb. 18-19

Malleable Foundry Operations

Discussed at Society Conference

By WILLIAM G. GUDE
EDWIN BREMER and
ROBERT HERRMANN

● THE GENERAL subjects of metal, foundry practice, personnel, and inspection and testing made up the discussion topics at the fourth annual Technical and Operating Conference of the Malleable Founders' Society.

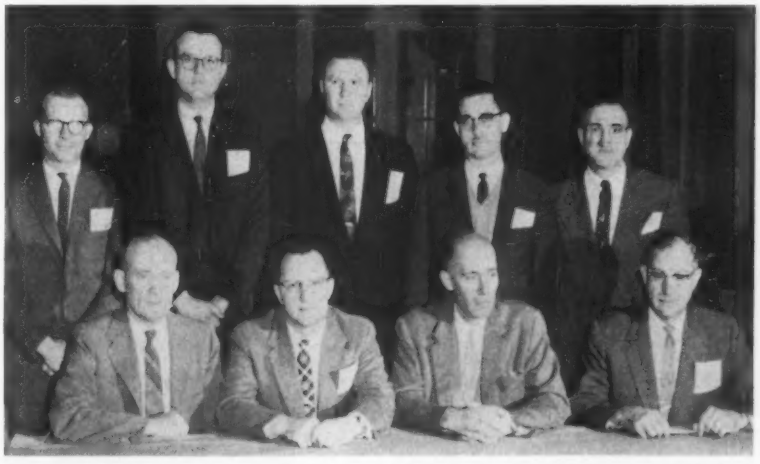
Held at the Wade Park Manor, Cleveland, Feb. 18-19, the meeting was attended by approximately 100 malleable iron foundrymen. Lyle R. Jenkins, Wagner Castings Co., Decatur, Ill., was program chairman.

Opening session included three papers on **Selecting Pearlitic Malleable Manufacturing Equipment.** Daniel L. LaMarche Jr., American Malleable Castings Co., Marion, Ohio, described the type of heat treating equipment suitable for the small producer. The particular unit he discussed costs about $26,000 and has a capacity of 375 to 400 pounds per hour on average size work. It performs a continuous operation through heating, quenching, and drawing. Gas consumption is 700 cu ft per hr in heat treating and 200 in the draw furnace. No special atmosphere is employed.

Norman N. Amrhein, Federal Malleable Co., Milwaukee, pointed to various factors which should be considered by the pearlitic malleable producer in selecting equipment. Essential requirements, in addition to the equipment, are competent personnel, quality controls, ability to produce castings in a range of grades, and success in holding down costs.

Another requisite is sufficient business volume to warrant the high investment represented by the heat treating equipment. The specific type of unit selected will be dictated by the processing method selected.

A highly automatic unit installed recently by Marion Malleable Iron Works, Marion, Ind., for production of pearlitic malleable was described by Lawrence E. Emery of that company. An electric furnace installation, it replaced coal-fired equipment, and has resulted in improved quality of product, faster production, reduced cost, and improved flexibility and working conditions. A detailed descrip-



Some of the speakers and session chairmen at the conference included, left to right, standing, Daniel L. LaMarche Jr., American Malleable Castings Co.; Donald B. Fulton, Northern Malleable Iron Co.; Jack Irish and Fred W. Jacobs, Texas Foundries Inc.; and John C. Goetz, Acme Steel & Malleable Iron Works. Seated, left to right, Dr. L. C. Marshall, Link-Belt Co.; Lyle R. Jenkins, Wagner Malleable Iron Co.; Hans J. Heine, MFS; and Paul F. Ulmer, Link-Belt Co.

tion of this operation will be presented in an early issue of FOUNDRY.

Effect of Melting and Heat Treating on Temper Carbon was discussed by John T. Bryce, Albion Malleable Iron Co., Albion, Mich. He described various tests which indicated the influence on temper carbon of charge composition, precipitators, tapping temperature, heat treating temperature, furnace atmosphere, and quenching. The importance of controlling nodule formation is obvious and requires understanding of the effect various factors have on its development.

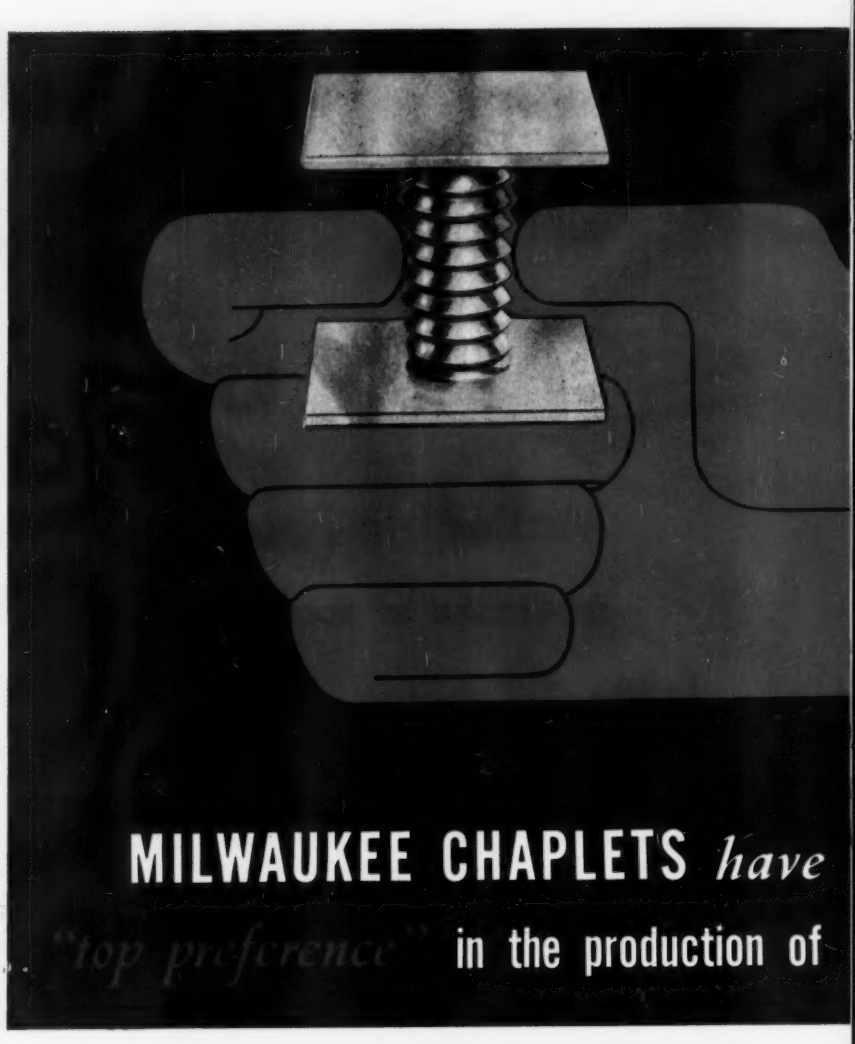
Problems of Hot Molding Sand, by Clyde A. Sanders, American Colloid Co., Skokie, Ill. Hot sand and too short a mulling time cause most sand troubles in foundries. At temperatures of 1650 to 2000° F molding sand has only half its normal dry strength. Other properties are affected at lower temperatures.

Making additions, such as water, to cool sand or correct individual properties affect other properties and multiply the trouble. The problem of hot sand can be reduced by adding more sand to the system or by using a naturally-bonded sand. Generally molding sand is too hot if it is above room temperature. It definitely is too hot if it is over 150° F.

Pinholes in castings resulting from aspiration of air into the metal, evolution of gas dissolved in the metal, and reaction from foreign particles in the metal were discussed.

Better Casting Design Through Stress Analysis, by Louis H. Ravitch, Central Foundry Div., General Motors Corp., Saginaw, Mich. Stress analysis was defined as the resolution of stresses that occur on a part due to its service function; it is used to determine and improve mechanical strength of the part.

Analysis techniques utilize brittle lacquer coatings and strain gages. When coated parts are subjected to a load, the coating cracks to indicate stress concentrations; by comparing the cracks with a calibration bar, the amount of strain can be determined. Also, strain gages measure strain, which is the unit movement measured in microinches per inch. Stress is the unit load measured in pounds per square inch. Stress at a given area of the test casting



MILWAUKEE CHAPLETS *have* "top preference" in the production of

THERE ARE many good reasons why Milwaukee Chaplets and Chills can do an outstanding job in producing sound, uniform castings. A brief inquiry on your part will bring complete details.

May we stress the fact that we are manufacturers with complete facilities to produce our own products. As such, we can guarantee strict adherence to your specifications, quality control of all material used, rigid inspection at every step of production and prompt service.

If you have a straight run-of-the-mill job or one that presents unusual problems, why not send us your blue prints. We will have the answer for you.

Milwaukee and

1025 SOUTH 40th ST.,

established

sound uniform castings

38 YEARS *of service to the Foundry Industry*

● This year marks our 38th Anniversary. Our history is a record of achievement in the building of close tolerance machinery; in research and development to constantly improve our products and in engineering service to solve your problems no matter how cumbersome they appear.

Today, we have every facility to serve you quickly and efficiently with the very finest chaplets and chills on the market.

CHAPLET

MANUFACTURING COMPANY

MILWAUKEE 46, WISCONSIN

Circle 667 on Page 53

can be determined by multiplying the modulus of elasticity of the metal by the strain.

The following basic concepts of good design will reduce stress concentration and improve serviceability of castings: Keep material away from the neutral axis. Keep plates in tension and ribs in compression. Use smoothly tapered sections. Avoid sharp corners and abrupt changes at adjoining sections by using fillets and blending radiuses. Keep casting sections as uniform in thickness as possible. Design ribs and brackets for maximum effectiveness.

Progress in Machinability Research, by Dr. L. C. Marshall, Link-Belt Co., Indianapolis. Results of research on machinability of various metals indicate that Brinell hardness is not a significant factor in determining energy requirements for machining or surface finish obtained. Properties of the material which probably have an effect are microstructure, chemical composition, and manufacturing process. In other words, the material itself is the most important single factor in machining operations.

Research also showed that oxide tools are superior to other tools for machining, if interrupted cuts are not involved. Machining rates can be doubled or tripled, and surface finish is improved by a factor of at least 2:1. Also, differences in machining various materials are less pronounced.

To provide **Inspection to Satisfy Customer Requirements,** Edward F. Price, Dayton Malleable Iron Co., Dayton, O., stated that the inspection department should have all possible information on the castings so that proper procedures can be set up. That will vary according to customer requirements and include such items as metallurgical factors, machinability characteristics, dimensional tolerances, appearance, and machining locations. Inspection must begin with seeing that pattern and other equipment, molding procedures, and other processes are suitable to make castings which will meet the requirements. Often the inspection department can suggest changes which benefit customer and foundry by eliminating costly finishing operations.

In discussing **Nondestructive Testing,** Dr. Robert C. McMaster, Ohio

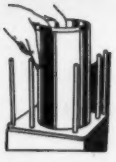
IT'S A FACT:

ALLIS-CHALMERS LIFT TRUCKS SAVE YOU MORE... MAKE YOU MORE!

HERE'S PROOF... When it comes to sustained high production over the years — ability to stay on the job and out of the shop — Allis-Chalmers trucks have it! As these owners happily admit:

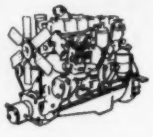
"They're tougher and require less maintenance," says the mechanic at a Wisconsin foundry. "I particularly like the overhead valves and wet cylinder liners — makes our job a lot easier."

Reason: Wet cylinder liners are easily replaced — no need to rebore.



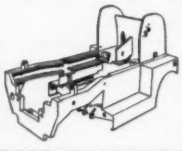
"Maintenance costs are one-third less than with lift trucks previously used" reports a Michigan factory. "We used to replace an engine a year," says the vice-president. Haven't replaced any in our Allis-Chalmers trucks."

Reason: The heavy-duty, industrial engine is the strongest and most rugged used in a fork truck.



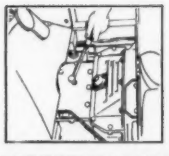
Downtime, None — That's the report of a Florida cement block manufacturer. His 4,000-lb lift truck has operated steadily for more than three years.

Reason: Rugged construction of Allis-Chalmers trucks which is typified by automotive-type frames.



"They're certainly accessible to work on," says the mechanic at a Missouri factory, "— although we have not had too much maintenance and no parts replaced at all so far."

Reason: A good example of accessibility: only 30 minutes is required to change a clutch.



Let your material handling dealer show you additional production and maintenance figures for Allis-Chalmers lift trucks that make their superiority a *fact*. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

BH-1058

Plan to stay ahead... MODERNIZE!

State University, Columbus, O., pointed out that such testing is carried on daily in foundries and other places by application of the five senses, hearing, sight, smell, taste and touch. While those serve satisfactorily for some purposes, they may not have the required sensitivity or are unable to provide the desired information. Then other testing means must be employed such as x-ray, penetrant, magnetic particle, and ultrasonic. After describing a number of different nondestructive testing media and their applications, he pointed out that it is important before selecting the testing method, to establish correlation between the properties measured and the serviceability controlling properties of the material being tested.

According to Jack Irish, Texas Foundries Inc., Lufkin, Texas, **Work Simplification** may be defined as the organized application of common sense to find easier and better ways of doing things. He reported that the best results are obtained when the emphasis is shifted from the experts to every one in the plant organization. To that end his firm established a teaching program for both supervisors and hourly employees to provide information on what work simplification is and how it may be accomplished. From that numerous suggestions developed which produced a saving of around $600,000 over a period of years. All suggestions are reviewed carefully, and where not acceptable, the reasons are given to the individual concerned. Suitable awards are given for accepted suggestions as well as public recognition to the recipient. The latter according to Mr. Irish is an important feature, and should not be neglected.

Dr. E. C. Nevis, Personnel Research and Development Corp., Cleveland, spoke on **A New Approach to Personnel Selection.** In selecting key personnel the usual practice is to use psychological tests to learn as much as possible about the prospective candidate for a job. Those tests will provide information on attributes, attitudes, and aptitudes that cannot be gained from personal interview. Results of such tests may be compared to results of similar tests on a large number of people or from tests on key groups within

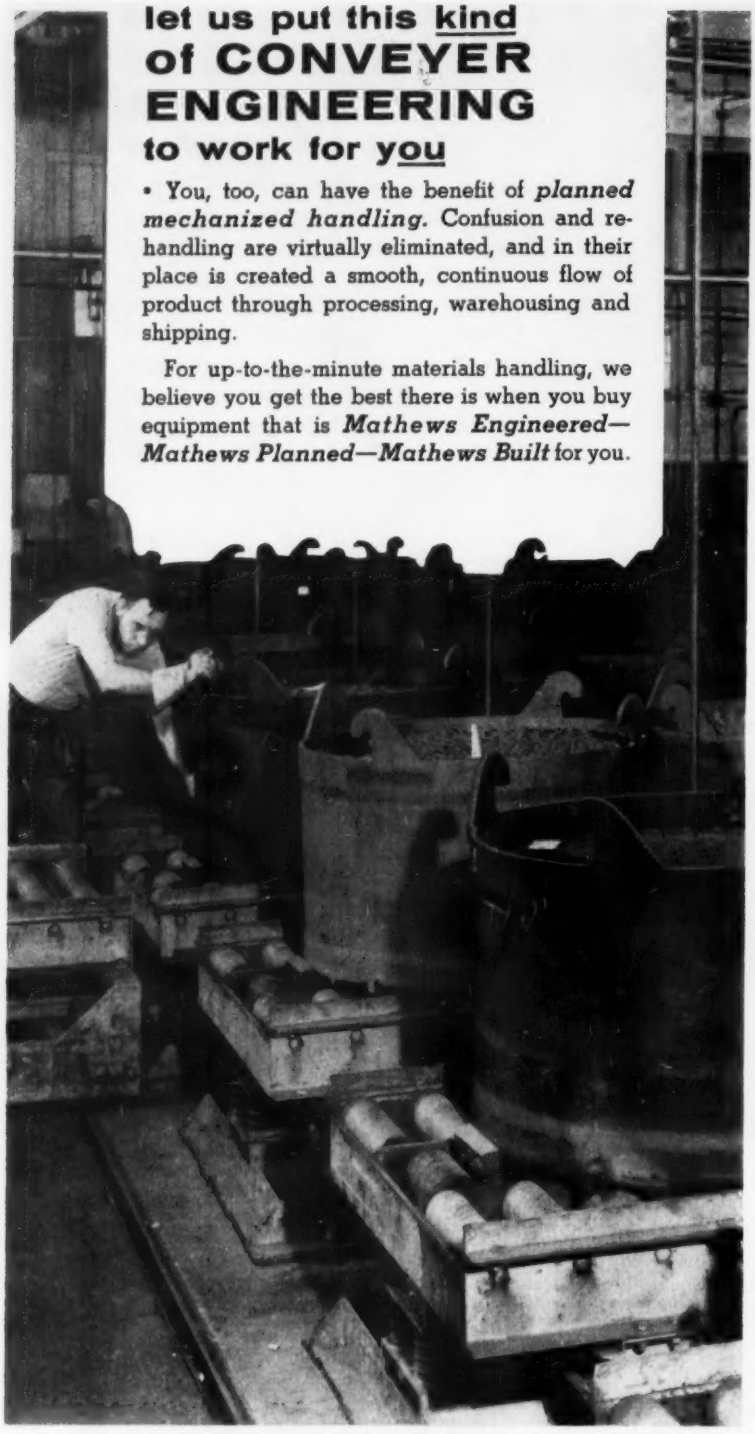
THE Metallurgist's skill and knowledge has an important bearing on nearly every operation in the gray iron foundry. For it is his responsibility to maintain and control quality standards and specifications, by modern methods such as chemical analysis and microphotography, illustrated above. The Metallurgist's special knowledge of the behavior of metals and their physical and mechanical properties is an indispensable ingredient in the production of top quality gray iron castings.

Pittsburgh Coke & Chemical Company is proud to salute the gray iron foundry Metallurgist. It is equally proud to serve as a basic supplier of two quality products for the nation's foundry trade . . . Neville Pig Iron and Neville Foundry Coke.

An enlarged (11½" x 11") reproduction of the above etching, suitable for framing, will be sent without cost upon request. Similar etchings from the previous advertisements of this series, featuring the Pattern Maker, Molder and Melter, are also available.

Neville Pig Iron and Neville Coke for the Foundry Trade

PIG IRON • COKE • FERROMANGANESE • CEMENT • COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON


let us put this kind
of CONVEYER
ENGINEERING
to work for you
• You, too, can have the benefit of planned mechanized handling. Confusion and re-handling are virtually eliminated, and in their place is created a smooth, continuous flow of product through processing, warehousing and shipping.
For up-to-the-minute materials handling, we believe you get the best there is when you buy equipment that is Mathews Engineered—Mathews Planned—Mathews Built for you.

MATHEWS CONVEYER COMPANY
GENERAL OFFICES . . . . . ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIV. . . . MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

MATHEWS
(Member Foundry Equipment Manufacturers Association)

an organization or plant, and give information on how the prospect will fit into an organization. While the tests serve well against turnover, they will not indicate how far a good prospect will go. The tests locate areas of strength or weakness in an individual and results may be used to direct activities to the best advantage, or suggest ways and means for improvement. Psychological tests are not a complete answer and some new ideas are being tried. As yet sufficient information has not been accumulated for assessment of their value.

Team work all along the line is necessary for **Fulfilling Promises of the Sales Department** according to Donald B. Fulton, Northern Malleable Iron Co., Minneapolis. In his opinion the operating end of the foundry can sell more than the advertising and sales departments by establishing a reputation for reliability and integrity. The foundry must take advantage of technical advances, see that proper equipment and methods are employed to supply castings according to the blueprint. Quality control is essential, and complete records of the practices employed with given castings should be maintained so that repeat orders can be fulfilled quickly. Careful records following an order through the various steps from start to finish should be kept. Those enable the determination of its progress at any time.

ASTM To Form New Division

A new Division on Materials Sciences will be organized by the American Society for Testing Materials to co-ordinate and intensify the development of knowledge of the fundamentals of materials. This new division, the first to be established by ASTM, will augment in depth and scope the society's long-time objectives of promoting knowledge of engineering materials and tapping new sources of knowledge for its extensive standardization activities.

The division will be concerned with the collection, establishment, and publication of basic information essential in creating a better understanding of materials and their properties, and especially will help to answer why materials are what they are.

CO_2 hardened cores and molds get extra refractory protection with

MEXICAN VV FLAKE

To meet the growing demands of foundries which need a good mold and core wash well suited to the carbon dioxide mold-core hardening process—The United States Graphite Company has pioneered and developed MEXICAN® VV Flake ("volatile vehicle"). This new mold and core wash comes in paste form and is completely compatible with isopropyl alcohol, oleum spirits, kerosene, or similar agents. Mixed with isopropyl alcohol as its thinner, it can be easily "lit off" to promote faster drying. Suitable for application by spraying or dipping, MEXICAN VV Flake provides excellent protection and peel for molds and cores . . . bringing to foundries which utilize the CO_2 technique, a new high in production and casting quality; and greater refractory protection for molds and cores. Use of MEXICAN VV Flake with isopropyl alcohol improves the skin hardness and allows molds and cores to be stored for longer periods of time without deteriorating. Comes in 55 gallon drums.

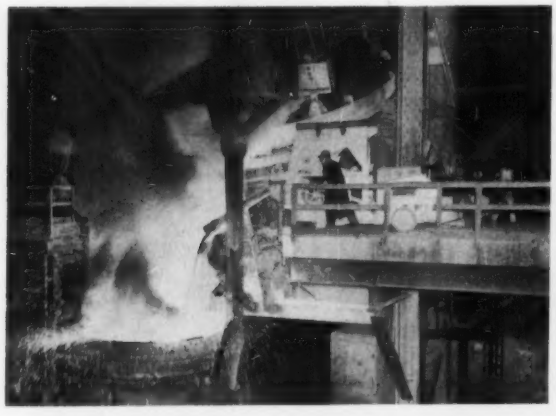
for further information on MEXICAN VV Flake or other quality MEXICAN products, write: 235

THE UNITED STATES GRAPHITE COMPANY

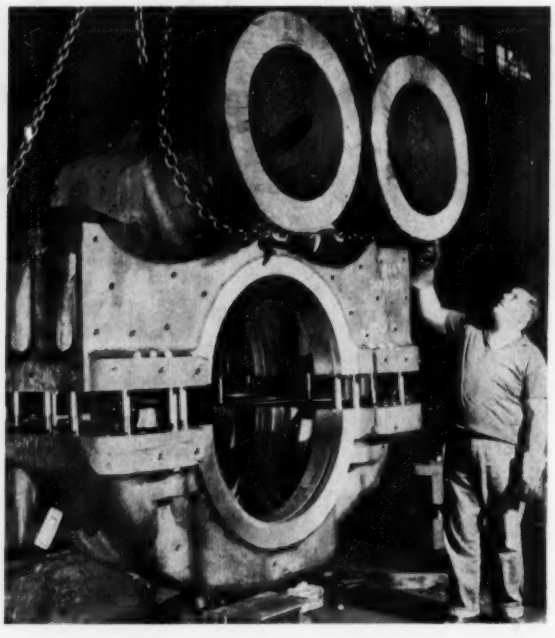
DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® SINTERED METAL PARTS • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

News Views



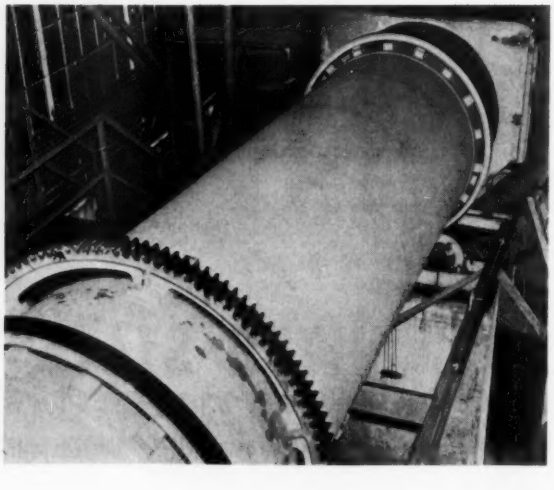
FERROALLOY FEEDER: Mobile ladle additions feeder designed and built by Blaw-Knox Co., Pittsburgh, feeds ferromanganese into a ladle during tapping of a 200-ton electric furnace. Capacity of the feeder is 12 cu ft, and the unit is powered by a gasoline platform truck



ATOMIC TURBINE: Portions of the first of two main propulsion turbines for a nuclear-powered guided-missile cruiser, the USS Long Beach, are fitted together at General Electric Co.'s Lynn, Mass., plant. The company also is making main propulsion equipment to equip other nuclear-powered ships for the Navy

JAPANESE FOUNDRYMEN: On a U. S. tour, Japanese from copper-base alloy foundries recently visited Crown Non-Ferrous Foundry Inc., Chester, Pa. Left to right, examining a bronze impeller, are R. C. Stokes, vice president and general manager of the company; Yanosuke Kobayashi; J. L. Rawlinson, International Co-operation Administration; Kojiro Mano, and Isamu Ueda. The group also included five other Japanese foundry executives

SAND CONDITIONER: This new rotary cooler, built by Standard Steel Corp., Los Angeles, is in operation at Kaiser Steel Corp.'s ingot mold foundry, Fontana, Calif. Sand from shakeout leaves the unit at about 150° F



No. 8® GRAPHITIZER

TREATS GREY IRON EFFECTIVELY FOR LESS THAN 10¢ PER TON!

Thousands of foundries are already employing No. 8 because it is such an amazingly simple and accurate graphitizer. No. 8 is a powerful inoculant. It plants graphite *throughout* the molten metal. No. 8 gives castings a higher machinability rating. It reduces chill and hardness in thin sections and improves wear and shock resistance. No. 8 makes castings more metallurgically uniform and, most important of all, No. 8 graphitizer *substantially reduces the cost of metal control* (cost figures in several foundries are below 10¢ per ton of metal treated). No. 8 is easy to apply by funnel or envelope method. As the photomicrographs shown here indicate, No. 8 is effective for special metallurgical control. From every standpoint it will pay you to use No. 8, regularly. For further details write for Engineering Bulletin No. 2.

Base Iron

Photomicrograph from broken half of 1.25 arbitration bar of gray iron not treated with No. 8 Cupola charge was made up of 48% steel, 33% cast scrap, 19% malleable pig iron and 45 lbs. of silicon briquettes. Total charge was 2544 lbs. This iron tested to the following physical properties: Transverse Strength 2,497 lbs. (wedge bar) • Brinell Hardness 229 (wedge bar) • Total Chill Depth 41/32 in., Clear Chill 26/32 in. • Deflection 0.23 in.

Note how the iron treated with No. 8 has increased in deflection. Usually iron treated with No. 8 will show an increase from 10% to 30% in deflection over the base iron value—this means less cracked castings and more serviceable metal.

Treated Iron

Photomicrograph from broken half of arbitration bar of same base iron treated with 1 lb. per ton of No. 8. Holding time in ladle following addition of Graphite was less than 8 minutes. Note how the addition of No. 8 has destroyed the dendritic pattern and has given a normal flake pattern. The treated iron tested to the following physical properties: Transverse Strength 2,970 lbs. (wedge bar) • Brinell Hardness 217 (wedge bar) • Total Chill Depth 13/32 in., Clear Chill 10/32 in. • Deflection 0.31 in.

GF240-1

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDERED METAL PARTS • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

Men of Industry

● **FRANK ROSS**
. . . named chief engineer

● **HENRY W. ZIMNAWODA**
. . . Canadian sales mgr.

● **RALPH W. SKERRATT**

● **JOHN C. LOPATTA**
. . . officers advanced by Falcon Foundry

● **Frank Ross,** for the past nine years vice president-engineering, Centr-O-Cast & Engineering Co., Detroit, has joined Permanent Mold Die Co., Hazel Park, Mich., as chief engineer.

G. J. Grott, formerly chief metallurgist, Michigan-Standard Alloy Casting Co., Detroit, recently joined WaiMet Alloys Co., there, as manufacturing manager.

● **Donald S. Goebel** has been named Chicago district sales manager, Wisconsin Centrifugal Foundry Inc. and Wisconsin Stainless Foundry & Machine Corp., Waukesha, Wis., succeeding the late James E. Magee. Mr. Goebel formerly was with American Smelting & Refining Co., New York.

● **Henry W. Zimnawoda,** since 1946 export manager and assistant sales manager, National Engineering Co., Chicago, has been named sales manager, National Engineering Co. of Canada. Educated in Poland, he was in foundry supervisory and metallurgical work there and in France and Brazil before he came to the United States in 1944. He joined National Engineering in 1946, after two years with New Jersey foundries.

A. L. Smith has retired as treasurer and secretary, Ann Arbor Foundry Co., Ann Arbor, Mich., after 38 years with the company.

● **T. Hamil Reidy** recently joined Lester B. Knight & Associates Inc., Chicago, as vice president.

● **Ralph W. Skerratt,** executive vice president, has been named president and general manager, Falcon Foundry Co., Lowellville, Ohio, succeeding the late L. M. Nesselbush. **John C. Lopatta,** operating vice president, has been made vice president. Messrs. Skerratt and Lopatta were two of the company founders in 1953.

● **J. Harry Reed,** formerly sales manager, Youngstown Foundry & Machine Co., Youngstown, Ohio, has been named vice president-sales. He joined the company's roll department 12 years ago.

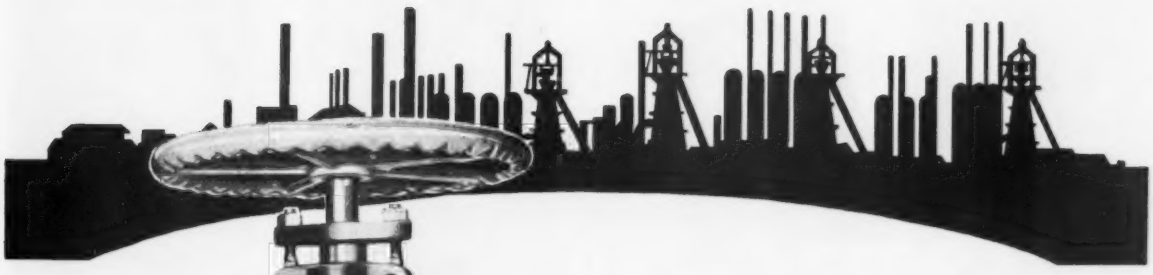
● **William E. Niemackl,** vice president-sales manager, Minneapolis Electric Steel Castings Co., Minneapolis, recently was named a direc-

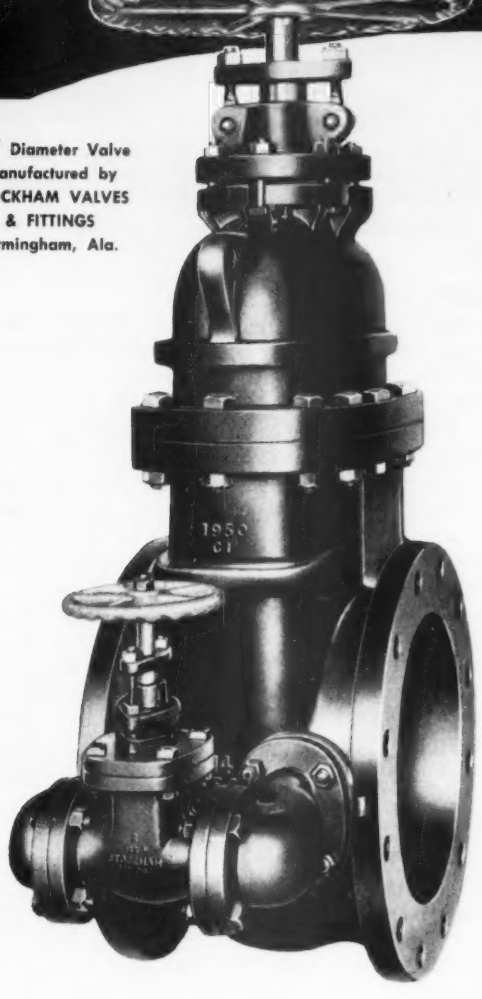
● **DONALD S. GOEBEL**
. . . district sales mgr.

● **T. HAMIL REIDY**
. . . joins Lester B. Knight

● **J. HARRY REED**
. . . becomes sales v. p.

● **WILLIAM E. NIEMACKL**
. . . becomes director





14″ Diameter Valve
Manufactured by
STOCKHAM VALVES
& FITTINGS
Birmingham, Ala.

WOODWARD IRON

Gives Rugged Strength to Quality

STOCKHAM VALVES

This 2000 lb., 54″ high, water and gas Double Disc Gate Valve, with bolted by-pass, was manufactured by STOCKHAM VALVES & FITTINGS, in its modern plant at Birmingham, Ala. It is typical of many sturdy, precision castings that are being made today of Woodward iron by the nation's leading foundries.

Quality Stockham valves are produced in a size range from 2″ through 30″. They efficiently co-ordinate rugged, balanced strength to withstand wear and insure dependable performance with the latest features of approved design.

Woodward invites inquiries from foundries requiring iron of uniform analysis for production of castings that must meet the strictest standards of exacting buyers.

For quotations, write or call our Sales Department, Woodward, Ala.
Phone Bessemer, Ala. HAmilton 5-2491
or Sales Agents for territory North of Ohio River:
HICKMAN, WILLIAMS & COMPANY with Sales Branches at—

609 Bona Allen Building, Atlanta 3, Ga.; 230 North Michigan Avenue, Chicago 1, Ill.; First National Building, P. O. Box 538, Cincinnati 1, Ohio; 1659 Union Commerce Building, Cleveland 14, Ohio; 1203 Ford Bldg., Detroit 26, Mich.; P. O. Box 335, Duluth 1, Minn.; 412 Guaranty Bldg., Indianapolis 4, Ind.; 70 Pine St., New York 5, N. Y.; 1500 Walnut Street Bldg., Philadelphia 2, Pa.; 1910 Clark Bldg., Pittsburgh 22, Pa.; 902 Syndicate Trust Bldg., St. Louis 1, Mo.

WOODWARD IRON COMPANY

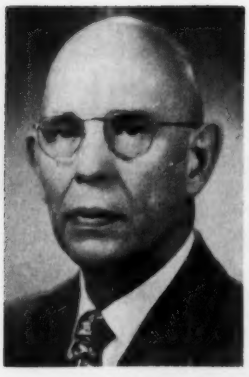
WOODWARD, ALABAMA

Independent Since 1882

Circle 672 on Page 53

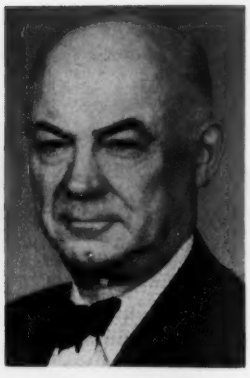
● KENNETH L. SELBY

● LAWRENCE G. BLACKMON



● WILLIAM M. EWING

. . . promotions announced by National Malleable



● RANDOLPH L. RUHLEY

. . . Branford Co. v. p.

tor. Other officers of the company were re-elected. **Robert C. Wood** is president.

George H. Schippereit has been appointed technical adviser, Battelle Memorial Institute, Columbus, Ohio, to advise the institute's metallurgical sponsors on formation of research programs. He was previously a division assistant chief specializing in nonferrous metallurgy problems.

Ray W. Patridge has been appointed sales manager, Special Products Div., Lebanon Steel Foundry, Lebanon, Pa. **Donald F. Smith** has been named sales engineer in charge of atomic energy work.

● **Albert W. Gruer Jr.** has been elected secretary and a director, Carondelet Foundry Co., St. Louis. He is also manager of sales and marketing. **Roy G. Heckenkamp** was named assistant secretary and treasurer and will serve as office manager in the accounting office.

● **William M. Ewing** has been appointed vice president-general manager, Capitol Foundry Div., National Malleable & Steel Castings Co., Phoenix, Ariz. **Edward A. Spring,** founder of Capitol, and general manager of the division since acquisition by National in 1952, continues as a consultant and on special assignments. **Lawrence G. Blackmon** succeeds Mr. Ewing as general manager, Sharon, Pa., Works. Mr. Blackmon became general superintendent there last year. **Kenneth L. Selby,** vice president-engineering, Transportation Products Div., Cleveland, was made vice president-general manager of the division.

● **Ernest W. Schaw** and **Fitz L. Sargeant,** general managers, southeastern and south central sales regions respectively, have been elected vice presidents, Reynolds Aluminum Sales Co. Mr. Schaw will continue his headquarters in Camden, N. J., and Mr. Sargeant in St. Louis.

● **Randolph L. Ruhley** has been elected vice president-general sales manager, Branford Co., New Haven, Conn. Mr. Ruhley is a director of the company.

Dr. Paul Lacombe has been appointed to the Chair of Metallurgy recently created at Case Institute of Technology, Cleveland, by Republic Steel Corp. Dr. Lacombe will teach a course in metallurgy at the graduate level and participate in certain research activities during his spring semester stay at the institute. He is head of the Department of Metallurgy and director of the Research Center at the School of Mines of Paris.

Edwin E. Pollard has been appointed works manager, Western Foundry Co., Tyler, Tex. Recently he had been with Tyler Pipe & Foundry Co.

Joseph I. Doherty, formerly assistant manager, has been appointed manager of the Windsor, Conn.,

● ALBERT W. GRUER JR.

● ROY G. HECKENKAMP

. . . Carondelet Foundry Co. appointments

● FITZ L. SARGEANT

● ERNEST W. SCHAW

. . . advanced by Reynolds Metals Co.

HERE'S WHY *you should try* "SEMI-STEEL" ABRASIVE

- Costs only **$155** per ton, at least *$50 less* than steel abrasives.
- It will do just as good a job of cleaning as steel abrasives — and do it *faster!*
- It will come *mighty close* to lasting as long in service as steel abrasives.
- "SEMI-STEEL" is easier on equipment than steel abrasives — and *we'll guarantee it!*
- You'll get a *written guarantee,* too, that you cut cleaning costs with "SEMI-STEEL".

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FREE ENGINEERING SERVICE....

METAL BLAST'S expert field engineer is ready to help solve your cleaning problems. Our testing lab is at your disposal, too. Write or phone for information on our Free Lab Test, engineering assistance and test samples.

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ALSO IN: Chattanooga • Chicago • Cincinnati • Dayton • Detroit • Elberton, Ga. • Grand Rapids • Greensboro, N. C. Houston • Los Angeles • Louisville • Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh and St. Louis.

"SEMI-STEEL" IS MANUFACTURED AS SHOT AND GRIT TO S.A.E. SPECIFICATIONS. 50 OR 100 LB. BAGS, PALLETIZED IF DESIRED.

say "when"!

with MARSHALL ENCLOSED-TIP THERMOCOUPLES

...for strong, dense, uniform castings from every melt!

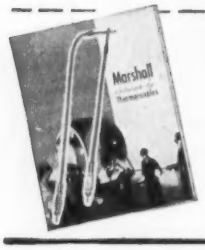
Reduce scrap rejects, misruns, cold-shuts . . . achieve consistently high quality castings! Marshall Enclosed-Tip Thermocouples indicate instantly and accurately "when" to pour brass, bronze, aluminum, or magnesium melts. Frequent, regular, exact temperature readings help avoid shrinkage porosity, gas porosity, dross . . . produce better casting finishes . . . control aluminum grain size.

Dependable, easy-to-use Marshall Thermocouples *take interior temperatures deep within the melt.* Tip can be stirred to speed reading, giving *true temperature in about 20 seconds.* Pyrometer always indicates *steady, accurate reading.* Thermocouple wire can't become contaminated from melt or short-circuited by slag. Tip withstands scores of immersions before replacement is necessary. Mail coupon for catalog today!

L. H. MARSHALL CO.

270 WEST LANE AVE., COLUMBUS 2, OHIO

Furnace Type (above) . . . lengths up to 10 ft., for use with Stationary Pyrometer.
Ladle Type (left) . . . for use with Portable Pyrometer.



L. H. MARSHALL CO., 270 W. LANE AVE., COLUMBUS 2, OHIO

Please rush Catalog which fully describes Marshall Enclosed-Tip Thermocouples!

NAME_____

FIRM_____

STREET ADDRESS_____

CITY_____

office and warehouse, Whitehead Metals Inc., New York, succeeding **Joseph C. Simmons,** who has become associate manager.

Lewis H. Gross, recently metallurgist, American Radiator & Standard Sanitary Corp., Baltimore, has been appointed instructor of foundry and metallurgy at the Mergenthaler Technical Vocational High School. Baltimore. He is a past chairman of the Chesapeake Chapter, AFS.

• **Roger B. Sinclair,** formerly head of the Management Engineering Div., Meehanite Metal Corp., New

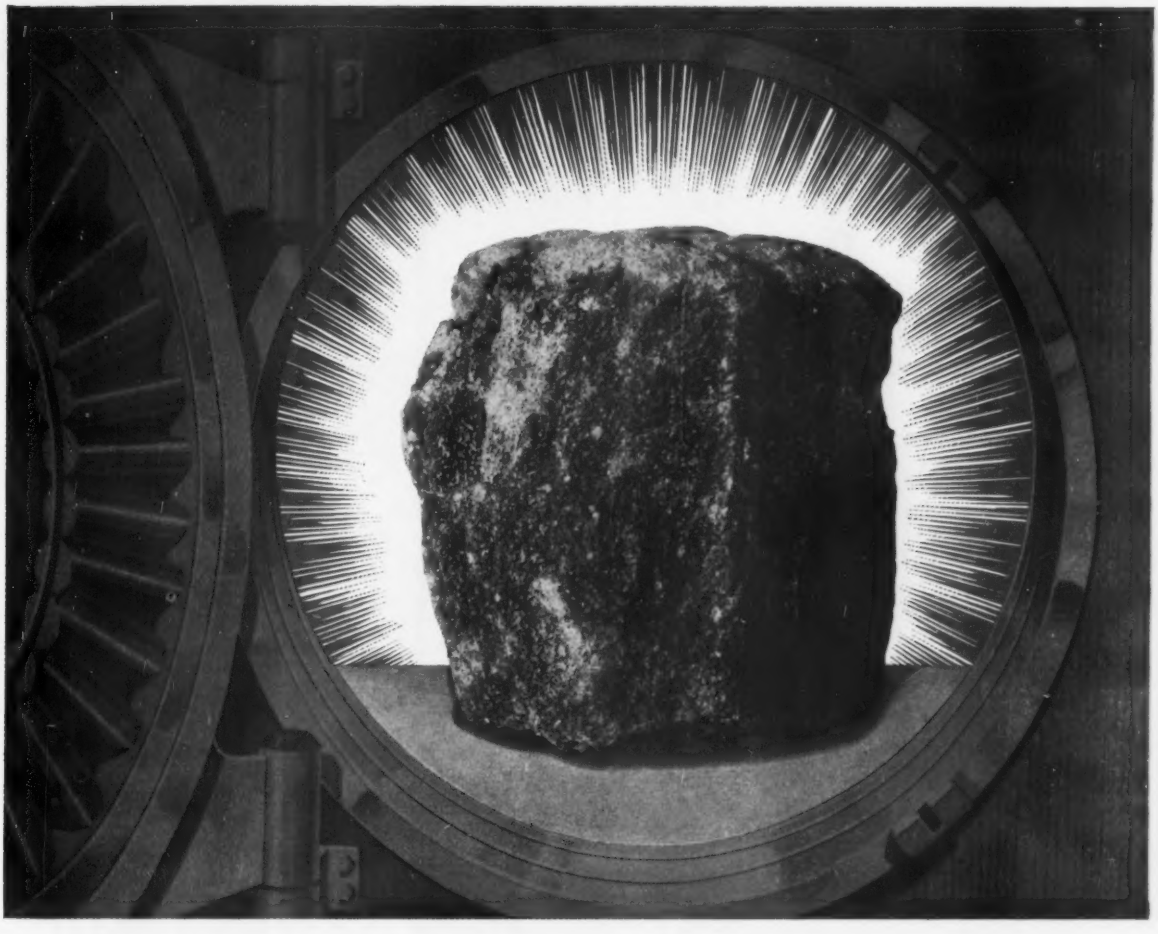
● **ROGER B. SINCLAIR**
. . . foundry consultant

Rochelle, N. Y., has established a new consulting service. Roger B. Sinclair Associates, P. O. Box 155, Larchmont, N. Y., will specialize in service to management of small and medium-sized foundries.

Albert J. Booth has been appointed plant manager, Stewart Die Casting Div., Stewart-Warner Corp., Bridgeport, Conn., succeeding the late George Wilder. Mr. Booth has been president and principal owner, Booth Products Inc., South Willington, Conn. **James C. Bell,** chief engineer, has been named superintendent of production and engineering at Stewart Die Casting Div.

G. Paul Clements, general sales manager, has been elected vice president and a director, Phillips & Buttorff Corp., Nashville, Tenn. He has been with the company since 1955.

Shoji Morikuni has been named president, **Clarence Schmidlin** vice president, and **Orville H. Mercer** secretary-treasurer, Midwest Pres-



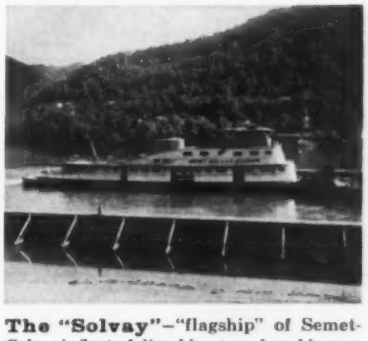
Valuable asset: ADAPTABILITY

ADAPTABILITY to individual cupola and melting requirements is one of the most valuable assets you can have in the coke you use.

When you specify Semet-Solvay foundry coke, you have a choice of *five* different sizes—offering maximum adaptability to your melting practice. And whichever size you choose, you are always sure of getting carefully screened, uniformly sized coke that is sturdy and blocky in structure, consistent in analysis, high in carbon.

Buying coke from Semet-Solvay offers you other advantages, too: Four strategically located plants for fast, dependable service . . . coke that is quality-controlled from mine to cupola . . . services of metallurgical experts to assist on foundry problems.

If you are not already a user of Semet-Solvay foundry coke, why not find out right away how it can help you realize a hotter, cleaner, faster cupola operation? Just contact your nearest Semet-Solvay office or write directly to us for complete details.



The "Solvay"—"flagship" of Semet-Solvay's fleet of diesel boats and coal barges that move coal by water routes from our mines to our coke plants.

Yours for better melting...

SEMET-SOLVAY DIVISION

Dept. 552-BH, 40 Rector Street, New York 6, N.Y.

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Allied Chemical

Circle 675 on Page 53

Just mention

UNIFORMITY

and you're already talking

KEOKUK SILVERY PIG IRON

SILICON METAL—OTHER FERROALLOYS

Correct! Because grade for grade Keokuk alloys give you a consistent quality melt—every time. Proof? Just send for new booklet—"*For Lower Costs, Higher Quality Products.*" You'll have your proof.

KEOKUK ELECTRO-METALS COMPANY, KEOKUK, IOWA;
Wenatchee, Division, Wenatchee Washington

When you think of SILICON . . . think of KEOKUK!

Sales Agent: Miller and Company
332 S. Michigan Avenue, Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

Junior knows what uniformity means now. Looking at their favorite image, Princess Wenatchee and Chief Keokuk

sure Casting Co., Chicago. The firm has been engaged in the manufacture of matchplates and pressure castings for many years.

• **Richard H. Beyer** has joined the Chicago district sales organization

● **RICHARD H. BEYER**
. . . joins Bay State

of Bay State Abrasive Products Co., Westboro, Mass.

• **William Muth,** formerly with Wellman Bronze & Aluminum Co., Cleveland, has joined George Sall

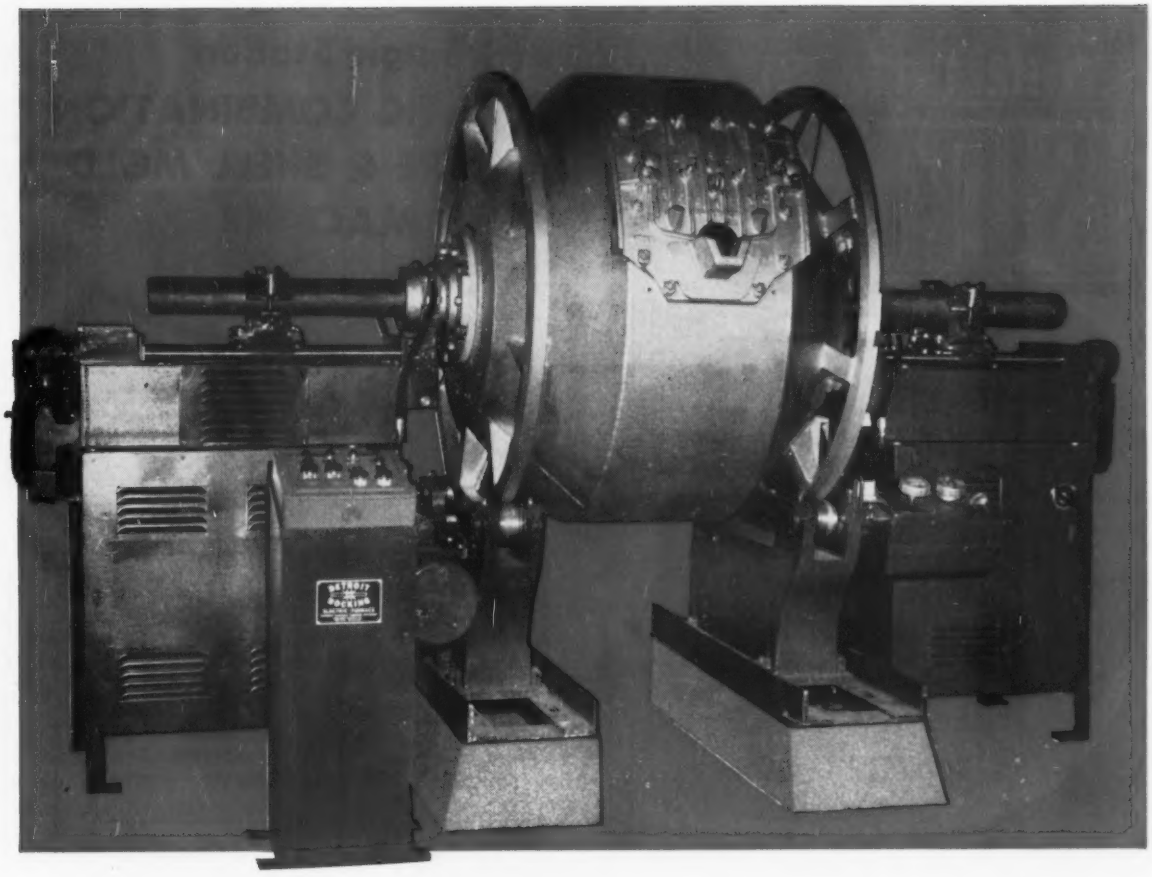
● **WILLIAM MUTH**
. . . joins George Sall Metals

Metals Co., Philadelphia, as sales representative in Ohio, with headquarters in Cleveland Heights, Ohio.

Frank J. Scott has been named industrial engineer, Bunting Brass & Bronze Co., Toledo, Ohio. He was formerly industrial engineering executive, Bucyrus-Erie Co., Erie, Pa.

J. D. Rullo has been appointed supervisor of x-ray sales, Ansco, Binghamton, N. Y., attached to the New York office. Ansco is the pho-

Circle 676 on Page 53



Get Greater Melting Efficiency With Detroit ROCKING Electric Furnaces

NEW ARC CONTROL SYSTEM AND MOTORIZED ELECTRODES ASSURE MAXIMUM HEAT UTILIZATION, AUTOMATIC ELECTRODE POSITIONING

The new "P" Series Detroit Rocking Electric Furnaces feature a simplified arc control system combined with motor-driven, pedestal-mounted electrodes.

The indirect arc is automatically controlled by a magnetic amplifier which adjusts motor speed in direct proportion to arc unbalance. This instantaneous action provides maximum heat per power input. There are no moving parts, relays or contactors to break or wear out.

Standard graphite electrodes are independently mounted on pedestals and motor driven. A ½ h.p. D.C. motor drives the automatic control. Direct-connected ⅓ h.p. A.C. motors on each electrode permit manual push-button control at greater speeds than possible by hand. This speeds electrode positioning for charging and shell change.

For full details on the new "P" Series indirect arc Detroit Furnaces, write for Bulletin 5610.

Ratings for furnaces with pedestal-mounted electrodes, motor controlled

Furnace Type	KW Rating	Nominal Cold Charge	Minimum Molten Metal
LFCP	125	350	500
LFNP	150	500	750
LFYP	175	700	1250
AAP	250	1500	3000
AAP	400	1500	3000
CMP	400	4000	8000
CMP	600	4000	8000

DETROIT ROCKING ELECTRIC FURNACES

Detroit Electric Furnace Division, Kuhlman Electric Company • Bay City, Michigan

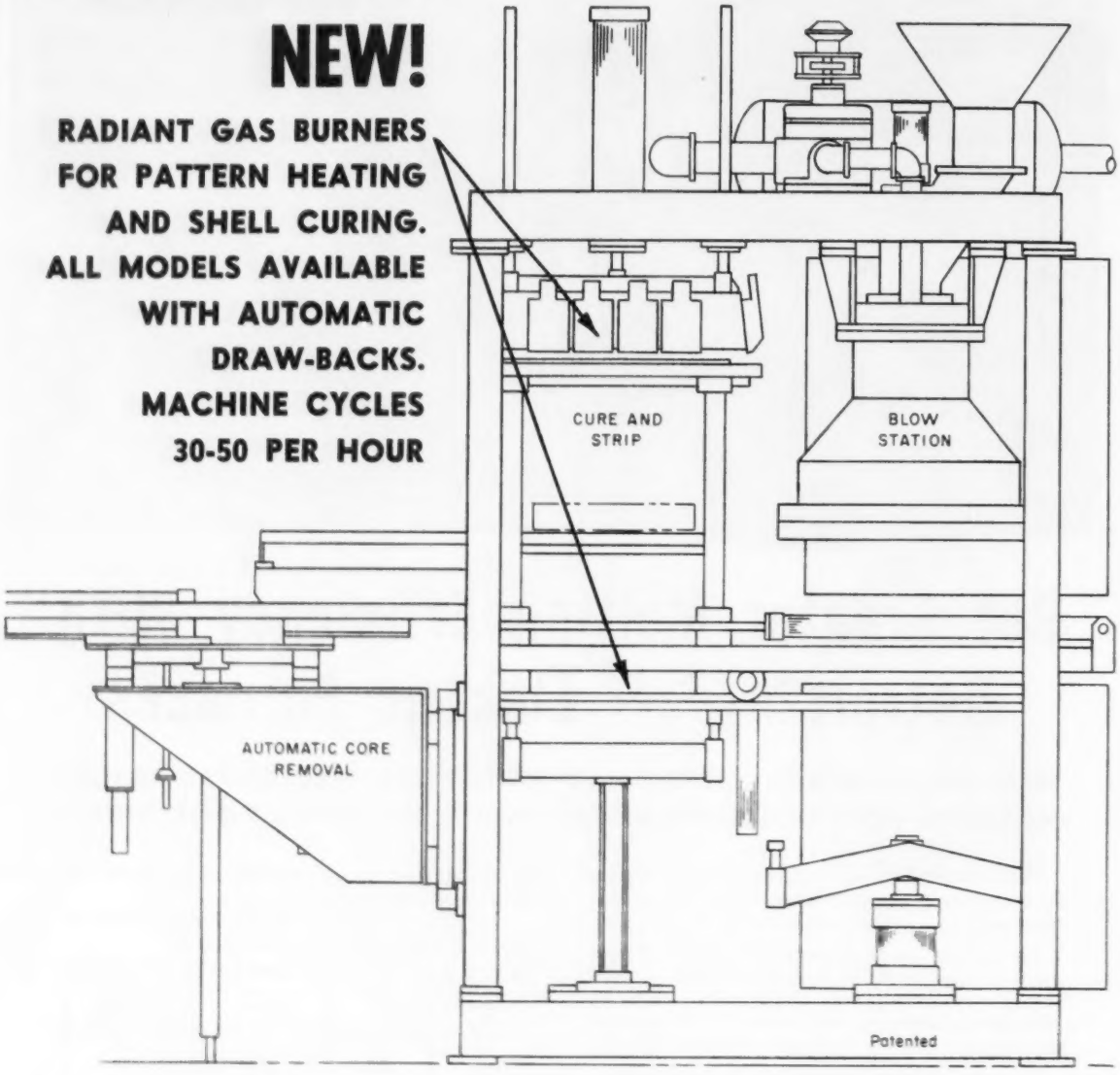
Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N.Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D.F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

SUTTER

NEW! Single Station AUTOMATIC COMBINATION SHELL CORE & SHELL MOLD BLOWING MACHINE

NEW!

RADIANT GAS BURNERS FOR PATTERN HEATING AND SHELL CURING. ALL MODELS AVAILABLE WITH AUTOMATIC DRAW-BACKS. MACHINE CYCLES 30-50 PER HOUR



MODELS AVAILABLE—S.P. 1600 S.P. 1630 S.P. 1650

PATTERN SIZES—24" x 28" x 10" 27" x 36" x 10" 27" x 44" x 10"

★

SUTTER PRODUCTS COMPANY

407 HADLEY STREET ME 7-7241 HOLLY, MICHIGAN

Circle 678 on Page 53

tographic manufacturing division of General Aniline & Film Corp., New York.

• **Jesse R. Fountain** has been appointed technical representative in

● JESSE R. FOUNTAIN
. . . *Misco casting sales*

Texas and Oklahoma, Misco Precision Casting Co., Whitehall, Mich., with headquarters in Dallas.

• **John N. Ludwig Jr.** has been made supervisor of metallurgical services, International Nickel Co.,

● JOHN N. LUDWIG JR.
. . . *INCO services supervisor*

New York, with headquarters in Pittsburgh. For 21 years he has been with Electro Metallurgical Co., a division of Union Carbide Corp., New York.

Richard E. Oswald has been named sales-service representative, Oswald Refractories Co., St. Louis. He joined the company last year.

John W. Thees has been named production manager, Doehler-Jarvis Div., National Lead Co., New York. **Charles I. Hodgson** has succeeded

WHEELABRATOR® STEEL SHOT SLASHES ABRASIVE COSTS 35%

AT EVINRUDE MOTORS

This impressive reduction in blast cleaning abrasive costs was accomplished by switching from a malleable type abrasive to Wheelabrator Steel Shot.

According to Mr. Joe Vinette, Foundry Superintendent, "Wheelabrator's Abrasive Engineer was very helpful in setting up a program of inspection, preventive maintenance, and proper operation of blast equipment. A simple record keeping system was established which resulted in better cost control information. Following his recommendations and switching to Wheelabrator Steel Shot, we have been able to cut our abrasive cost by $0.96 per wheel hour!"

Your Wheelabrator Abrasive Engineer will help you achieve similar savings. Write for details of this exclusive service.

Send for complete information on how Wheelabrator Steel Shot can solve your cleaning problems.

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505 South Byrkit Street Mishawaka, Indiana
Canadian Offices: Scarborough (Toronto) – Montreal
World's Largest Manufacturer of Steel Abrasives

Circle 679 on Page 53

SAVE

WITH *Acme*

MELTING POTS
INGOT MOLDS

Designed by
FOUNDRYMEN...
for FOUNDRYMEN

You'll find it pays to standardize on Acme melting pots and ingot molds. They reduce down time and replacement costs because they're cast from a special iron formula that combines strength with high temperature resistance. They improve quality and reduce rejects, too, because they're designed for even heat distribution without hot spots. If you melt any non-ferrous metals, take advantage of our more than 30 years' experience in this field. It's your assurance of consistent high quality in Acme melting pots and ingot molds . . . designed *by* foundrymen, *for* foundrymen.

Quick delivery anywhere in the United States.
Write for size list showing 40 standard sizes.

Acme **FOUNDRY CO.**

2502 22nd St. • DETROIT 16, MICH. • *Phone* TAshmoo 5-2404

Mr. Thees as manager of the division's Plant I, Toledo, Ohio. **Richard M. Hindman,** former assistant chief engineer, takes over Mr. Hodgson's former duties as sales manager of both Toledo plants.

Albert W. Kreutzberger recently joined Milwaukee Die Casting Co., Milwaukee, as chief designer. He has been a tool and die designer for many years.

• **I. W. Gower** has been appointed director of research, Botfield Refractories Co., Philadelphia. Formerly

• I. W. GOWER
. . . director of research

he was in the research department, Mexico Refractories Co., Mexico, Mo.

John H. Haines Jr. has been assigned to metals industries sales in the Cleveland district, Allis-Chalmers Industries Group, Milwaukee. Mr. Haines joined the company in 1956. **Kenneth H. Wahl** was appointed sales representative in the Hartford, Conn., district, and **Harold H. Hood,** Boston.

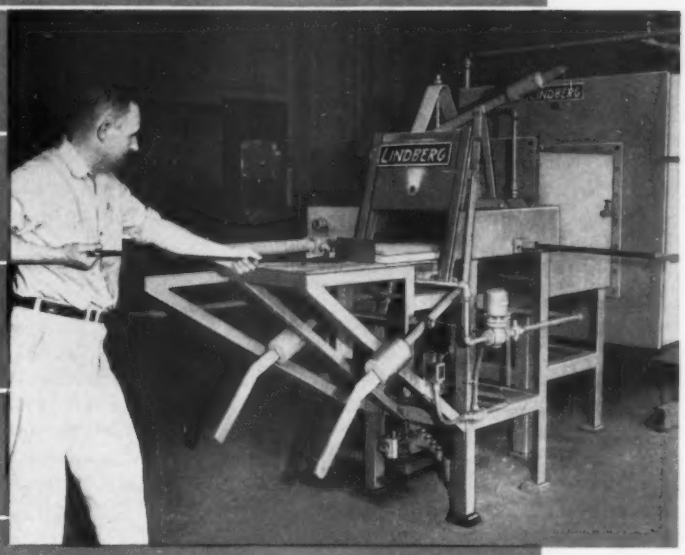
Glenn W. Hough has been named sales manager and **Alden C. Hensel** plant manager, Acheson Mfg. Co., Rankin Station, Braddock, Pa. Mr. Hensel formerly was with Albion Malleable Iron Co., Albion, Mich.

Lloyd Cowdin has been appointed northern California representative, Mead Specialties Co., Chicago, with headquarters in Oakland.

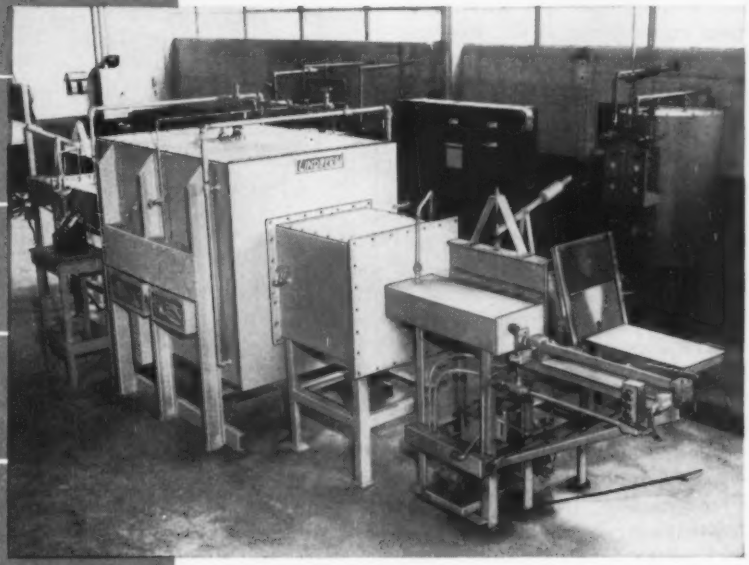
Rupert C. Bing has been named eastern sales representative and **Robert D. Burns,** midwestern representative, New Jersey Zinc Co.,

If your production needs call for Sintering call on Lindberg for just the right Furnace

As it does in all types of industrial heating equipment; Lindberg provides a complete line of sintering and brazing furnaces. Here is one of our latest:



A new Lindberg development, this Molybdenum Element Atmosphere Pusher Furnace is designed with high temperature refractories suitable for low dew point without need for a muffle. It is now being used for sintering stainless steel compacts in hydrogen or dissociated ammonia. Ammonia dissociator and control panels are shown at the right of the furnace below. In this installation hydrogen supply cylinders are located outside the building. Furnace provides side loading and discharge ports with purging chambers. Work trays, ceramic slabs or molybdenum boats, move through the furnace by hydraulic pusher. If you have a sintering or brazing problem why not talk it over with Lindberg. Just get in touch with your nearest Lindberg Field Representative or write us direct. Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois.



Type MOP-12307-A66C Molybdenum Element Atmosphere Pusher Furnace. Maximum Temperature 3000° F. 60 KW input. 12" wide, 30" long, 7" high. 66" cooling chamber, 36" long preheat chamber.

Look up Lindberg, Booth 2, at METAL POWDER SHOW in Philadelphia

LINDBERG heat for industry

Circle 681 on Page 53

New York, with headquarters in New York and Chicago respectively. **John P. Del Vecchio** has been made technical service representative with headquarters in the New York office.

Roger G. Kimber, since 1955 manager of railway specialty sales, has been appointed assistant vice president - sales, Transportation Equipment Div., American Steel Foundries, Chicago. He has been in the company's railroad sales for 13 years.

● **Rex Harrison,** formerly sales manager, Reading Gray Iron Castings Inc., has joined his father, **R. B. Harrison,** as a partner in International Foundry Supply Co., Reading, Pa. Rex Harrison is vice president of Reading Foundrymen's Association.

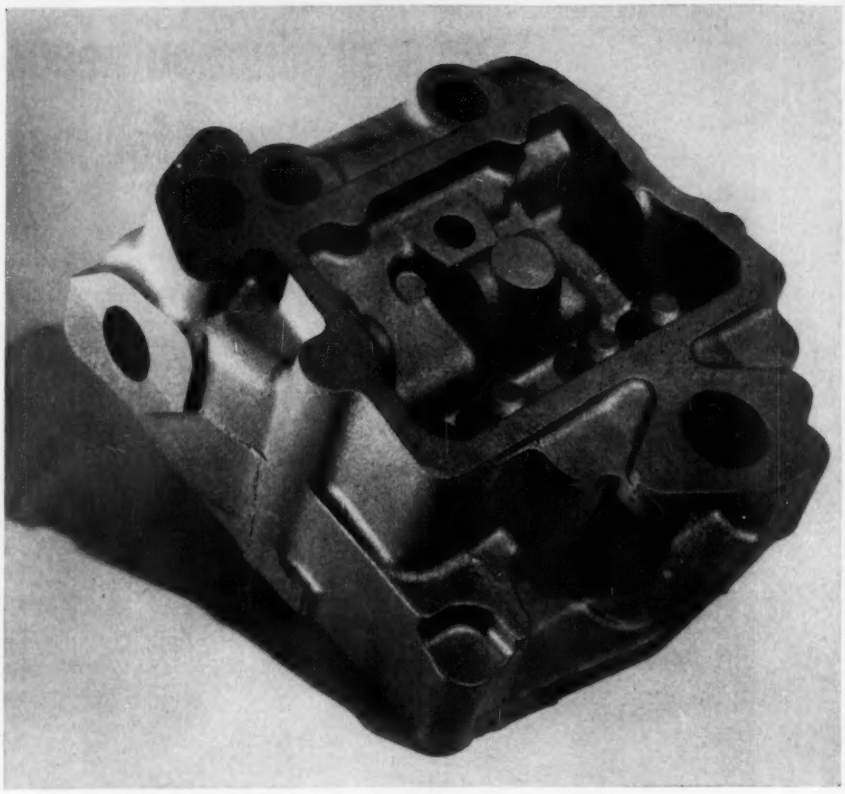
● **REX HARRISON**
. . . becomes partner

James A. Brickett, formerly assistant sales manager, has been appointed sales manager, Arcos Corp., Philadelphia, maker of welding rods and electrodes.

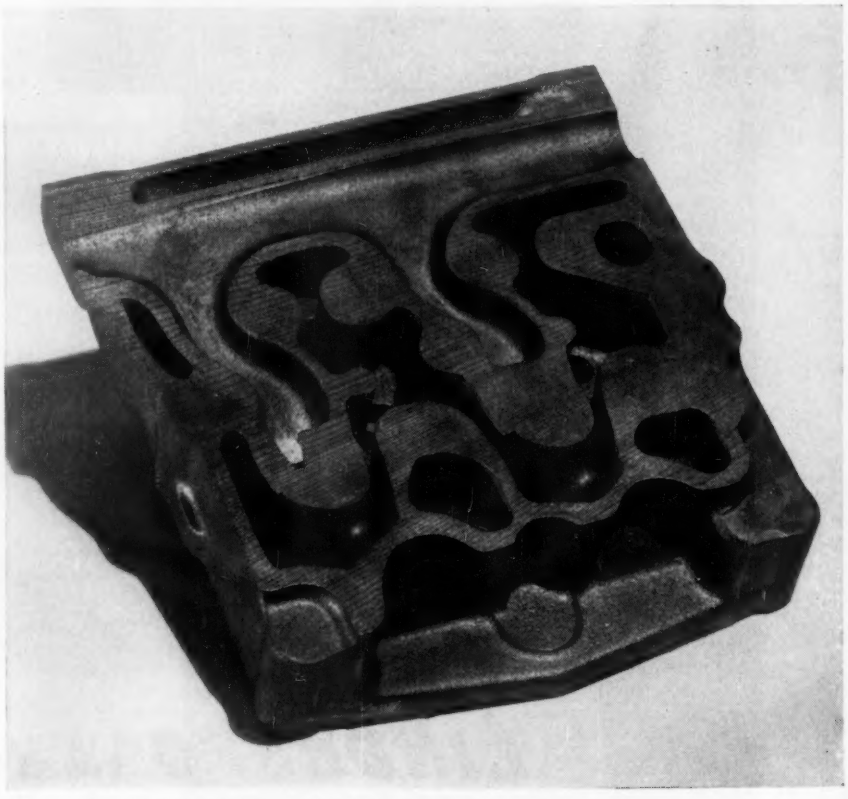
Elmer Hasz has been appointed director of purchases at the Camden, N. J., plant of Universal-Rundle Corp.

Mark M. Adkison, former melting superintendent, Production Foundries Div., Jackson Industries, Birmingham, has joined Alabama By-Products Corp., there, as foundry service engineer.

Robert F. Sommer has been made personnel manager, Weatherhead Co., Cleveland. He formerly was in industrial relations and personnel



CUTS MACHINING TIME because of the close tolerances and fine surface finish obtained with Durez resin-bonded shell molds and cores.



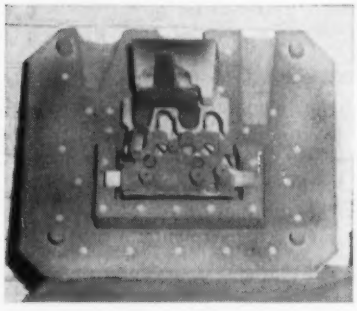
SMOOTH, CLEAN INNER SURFACE—just what the customer ordered—is achieved with shell coring, employing Durez foundry resins.

A "natural" for shell molding and coring

That's the way engineers at Brillion Iron Works, Inc., describe this 22.5-lb. block for an engine used in starting heavy tractors.

Brillion pours this gray iron casting entirely in shell, bonded with Durez resins exclusively.

Why shell? The inner surfaces of the block must be *clean and smooth.* Water flows through these channels, warming up as it circulates between the starting engine and the main engine. Any obstruction or undue roughness in the channels would impair the flow of coolant. From the design standpoint, smoothness is a prime reason for using shell cores.



SHELL CORES provide the accuracy needed for uniform section thickness in block.

From the foundry standpoint, shell coring speeds production, because it eliminates the need for core dryers with their attendant warping and breakage problems.

For even heat transfer without hot spots, the block must be *uniform in section thickness.* With shell molding and coring, Brillion gets the close tolerances that make uniform thickness a fact—and *keep* the block dimensions similar, piece after piece after piece.

Finally, Brillion's customer gets a casting that needs only a minimum of machining—a factor bearing directly on end cost.

Why Durez? Brillion's reasons for standardizing on Durez foundry resins could likewise be *yours.* With Durez resins, you get the unmatched uniformity, drum to drum and shipment to shipment, that's vital to consistent molding results. You also get the newest resin developments *first,* thanks to unremitting Durez research in shell molding.

Durez technical men really work at their job of helping you get into productive, profitable shell molding. Your Durez man knows the answers, because he is foundry-trained—and backed by 37 years of resin experience. For quick, competent help, call him in soon.

HERE'S THE LATEST on shell molding—authoritative, up-to-the-minute data on patterns, materials, mixing, temperatures, lubricants, molds, cores. It's the new 36-page "Durez Guide to Shell Molding" that can help you evaluate the process for your foundry. Write for your free copy today.

DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION

1004 Walck Road, North Tonawanda, N. Y.

with Crucible Steel Casting Co., Harsch-Ebaloy Foundries Co., and Ferro Machine & Foundry Inc., all of Cleveland.

• **Stephen Pasick,** formerly with Brooks Foundry Inc., Albion, Mich., has been named sales-service engi-

● **STEPHEN PASICK**
. . . *sales-service engineer*

neer, Battle Creek Foundry Co., Battle Creek, Mich. Mr. Pasick is vice chairman of Central Michigan Chapter, AFS.

• **William L. Kurz** has been named secretary, W. W. Sly Mfg. Co., Cleveland, in addition to his duties

● **WILLIAM L. KURZ**
. . . *Sly Mfg. Co. secretary*

as assistant to the president. He joined the company more than ten years ago.

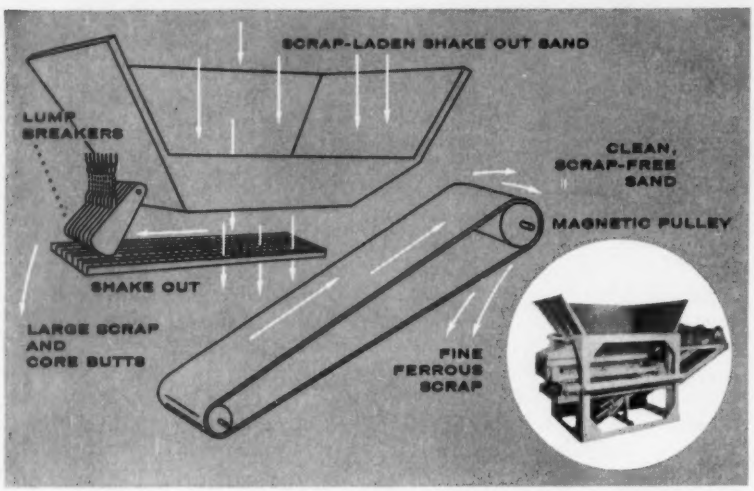
G. V. Patterson, manager, Ventilator Div., Swartwout Co., Cleveland, has been made a vice president of the company.

Charles Snyder, sales promotion manager, Stone Machinery Co., Manlius, N. Y., has been made gen-

SAND CONDITIONING TOPICS

PUBLISHED BY ROYER,
MANUFACTURERS OF THE FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER



Sand Contamination Drains Your Profits

Periodic business recessions in the foundry industry point up the need to eliminate waste and excessive hand labor—or sacrifice profits. In one area of foundry operation—sand contamination — important strides have been made in stopping the profit drainage.

Tramp iron damage usually occurs at the muller, conveyor belts, aerator or patterns. Patterns faced with contaminated sand produce poor casting finishes and high scrap loss. Probably the most efficient and economical way to remove contamination and produce clean sand is with a Royer Scrap Control Unit.

Referring to the drawing, shake out sand from the molding floor is dumped by front-end loader into the receiving hopper. Large scrap is riddled out by the Shake-Out and discharged at convenient wheelbarrow height for collection and removal.

Ferrous scrap small enough to pass through the grid openings of the Shake-Out is separated from the sand by a magnetic pulley at the upper end of the conveyor belt. Depending upon the degree of mechanization you employ, clean sand discharge may be made to a skip hoist feeding a muller, conveyor belt, or into the hopper of a Stationary Royer Separator and Blender for cooling, aeration and blending. We recommend discharge onto a heap for transporting by front-end loader to a Portable Royer Separator and Blender at the molding station for cooling, aerating and fluffing.

If tramp iron is the cause of any of your profit loss, we invite you to discuss your problem with the foundry-wise Royer agent serving your territory. He'll explain how a Royer Scrap Control Unit can pay for itself in less than two years, stop your profit drainage and improve the quality of your castings.

Your first step in stopping profit drainage caused by sand contamination is to mail the coupon for our latest Scrap Control Bulletin. We'll send it without obligation—plus the name of the agent who serves you.

ROYER FOUNDRY & MACHINE CO.

ROYER 159 PRINGLE STREET KINGSTON, PENNA.

Sand Contamination is cutting into our profits. Please rush me your Scrap Control Bulletin.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

eral sales manager, to direct sales of high speed cutoff saws. He joined the company in 1957.

Gordon J. Duerr has been elected vice president-marketing, **George E. Franck** vice president-engineering and research, and **Fred W. Winter** vice president-manufacturing, Imperial Brass Mfg. Co., Chicago.

● **Thomas E. Douglass,** formerly assistant to the president, Simonds-Worden-White Co., Dayton, Ohio,

● **THOMAS E. DOUGLASS**
. . . becomes sales mgr.

has been made sales manager of grinding wheel products for the company.

Dr. Charles E. Reed has been named general manager, Metallurgical Products Dept., General Electric Co., Detroit, succeeding **Kenneth R. Beardslee.** Mr. Beardslee, who has held the position since 1951, becomes a department consultant.

A. J. Edgar, formerly with Ross-Meehan Foundries Inc., Chattanooga, Tenn., has joined the Alloy-Metal Div., Tennessee Products & Chemical Corp., with headquarters in Chattanooga.

Joseph A. Ackermann has been named sales manager, Elwell-Parker Electric Co., Cleveland. **John A. Draxler,** assistant chief engineer, has succeeded Mr. Ackermann as chief engineer.

G. A. Gilbertson, president, Frank G. Hough Co., Libertyville, Ill., has been elected president of the Construction Industry Manufacturers Association.

Yes...For the Uniform, Balanced Blend Smith L-O Core Oil

The correct balance of materials that go into Smith L-O count a lot toward the development of sound, accurate cores — large or small.

A complete analysis of your facilities by a Smith Practical Foundry Serviceman can be most valuable, for his broad experience qualifies him to recommend the *right* grade of Smith L-O for you.

If you have a problem, call in a Smith man for a study of your situation. You'll find, then, that Smith L-O *stands for a service as well as a product.*

Smith L-O Core Oil

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.

INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

SMITH REPRESENTATIVES

- ALGONQUIN CHEMICAL CO., INC. Hamburg, Pennsylvania
- FOUNDRIES MATERIALS CO. Coldwater, Michigan
- FOUNDRY SERVICE CO. Birmingham, Alabama
- F. F. SHORTSLEEVE Elmira, New York
- ATLAS FOUNDRY SUPPLY CO. Santa Ana, California
- ST. LOUIS COKE & FOUNDRY SUPPLY CO. St. Louis, Missouri
- BRUCE-CONREAUX CO. INC. Indianapolis 7, Indiana
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Columbia University Offers Workshop on Heat Transfer

A workshop on "Heat Transfer in the Foundry" will be conducted June 22-26 at Columbia University by Prof. Victor Paschkis, director of the heat and mass flow analyzer laboratory.

Discussion of problems such as elements of heat transfer, solidification, core baking by dielectric heating, and annealing practices will be discussed, and demonstrations on the heat and mass flow analyzer will be given. The latter is a large-scale computing device used successfully to determine solidification behavior of castings and other items of concern to foundries.

The workshop, to be given without academic credit, will cost $150 per person, exclusive of room and board. Inquiries should be addressed to Heat and Mass Flow Analyzer Laboratory, Room 624 Engineering Bldg., Columbia University, New York 27, N. Y.

British Foundry Exhibition To Be Held in Birmingham

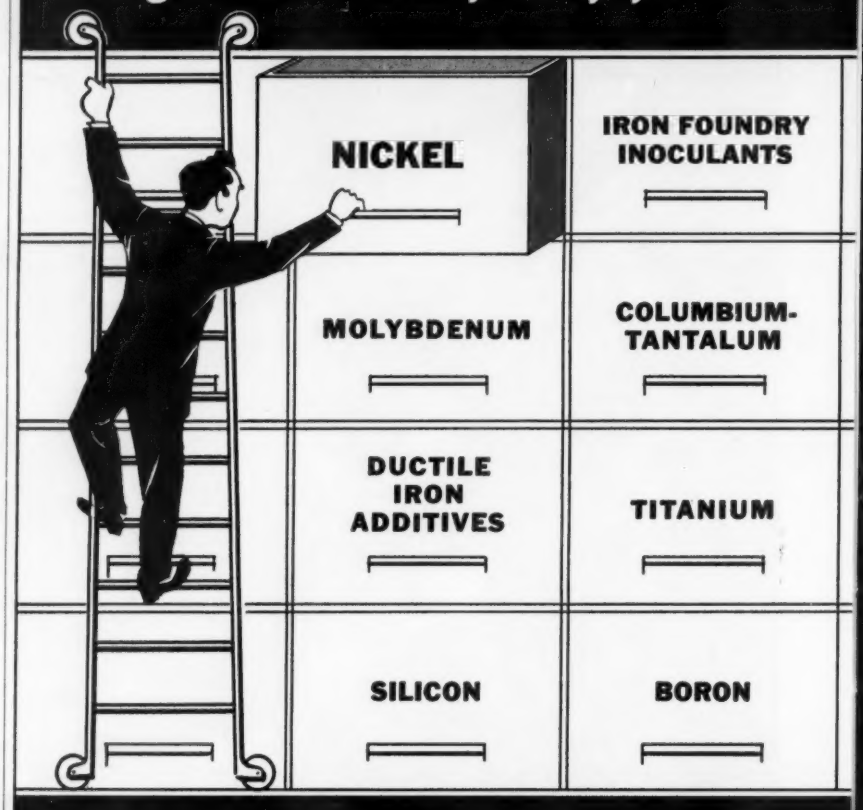
Great Britain's first national exhibition devoted solely to the foundry industry will be held in Birmingham, England, May 21-30 at Bingley Hall. Nearly 100 producers of foundry equipment and supplies will participate, many with operating exhibits.

The exhibit is sponsored by the Foundry Trades' Equipment & Supplies Association Ltd. The display will be open between 10 a.m. and 6 p.m. daily, except Sunday. Inquiries should be addressed to the organizers, Herbert Daniels Exhibitions Ltd., 3 Clifford St., London W. 1., England.

Foundry Installation Wins Industrial Lighting Award

Jack X. Britton, Miller Co., Pittsburgh, won an industrial lighting (high-mounting) award for an outstanding installation he designed for Washington-Mold Machine & Foundry Co., Washington, Pa. Mr. Britton was one of six who won national recognition from General Electric Co.'s Large Lamp Dept., Cleveland, in the "Power Groove

You get the foundry alloy you need



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Nickel, Silicon, Chromium, or any one of more than 96 other alloys off-the-shelf – you name it! Virtually all the foundry alloys you could possibly use are at your nearest Whitehead warehouse. You can get handfuls to carloads in the standard sizes and forms you prefer. You'll find the price is right, too!

These foundry alloys are all the quality products of such leaders in industry as The International Nickel Co., Vanadium Corporation of America, and Shieldalloy Corporation.

So, why not check your supply of foundry alloys? If your stocks are low, get what you need, off-the-shelf, from Whitehead.

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Plus Items for Foundries:

Welding Rod – Whitehead Metal "Supermarkets" maintain full stocks of a wide range of welding and brazing supplies. Two of the most popular items are Ni-Rod and Ni-Rod "55" Electrodes which many foundries use in salvaging castings with defects, for repairing heavy sections and joining dissimilar metals. Check your Whitehead man for detailed information.

Aluminum Core Plate – Strong, light-weight, easy to use. Good long-lasting flat core plate available "off-the-shelf" from Whitehead.

Fasteners, too – Screws, bolts, washers, etc., in the quality alloys.

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Circle 685 on Page 53

Parade" competition conducted by the department.

Nominations Are Opened for Doehler Diecasting Award

Nominations are open for the 1959 Doehler Award, which recognizes outstanding contributions to the advancement of diecasting. The award, a plaque and cash honorarium of at least $500, is made annually by the American Die Casting Institute, national association of custom die casters.

Three considerations govern selection of the recipient: 1. Technical achievement, as measured by significant contributions of a metallurgical or engineering nature. 2. Advancements in plant operations of a management or administrative nature, related to the operational phases of the industry. 3. Other activities, not primarily of a scientific or operational nature, which enhance the reputation and acceptability of diecastings.

To be eligible for consideration an achievement must be applicable generally to the industry. Nominations, with supporting papers or other related material, should be submitted before April 15 to the Award Committee, American Die Casting Institute, 366 Madison Ave., New York 17, N. Y.

Book Review

Grounds Maintenance Handbook by Herbert S. Conover. 500 pages, 6 x 9 in., published by F. W. Dodge Corp., 119 West 40th St., New York 18. Price $10.75.

This comprehensive volume is the only book ever published with complete information on the maintenance of public, semipublic, industrial, and private grounds. Important aspects of grounds maintenance are covered in ten chapters under the following titles:

Planning, scheduling, and public relation; growing and maintenance of turf; planting and care of trees, shrubs, and perennials; equipment maintenance and use; insect and disease control; weeds; soil erosion; maintenance of roads and parking areas; materials specifications; maintenance of picnic areas.

The book contains over 225 drawings, photographs, and tables.

Around the Country

NEWS REPORTS FROM

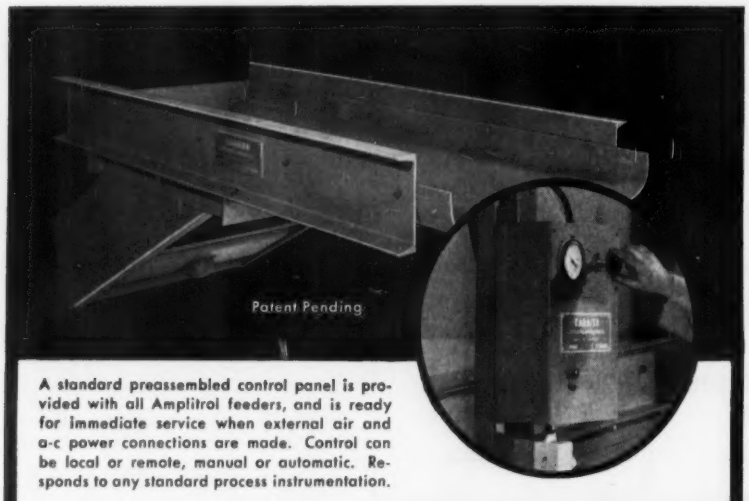
Chicago . . . Boston . . . Philadelphia . . . Pittsburgh . . . Detroit

Pittsburgh—With the revival of Pittsburgh's basic industry, foundrymen have good reason to feel optimistic.

Mills are placing big orders for castings to be used in blast furnaces and in maintenance and repair work. Demand for ingot molds is holding many producers close to capacity operations. Roll manufacturers have seen a tremendous pickup in their sales. Many are booked solidly through June.

In general, foundries dependent on the steel, automotive, agricultural equipment, and construction industries are faring best. Press manufacturers are coming into the market for bigger tonnages, but machine tool builders remain inactive.

Recovery is still very spotty. Many of the small jobbing shops are living on a hand-to-mouth basis, operating only three or four days a week. "We've had a little more activity in quotations," a sales manager comments, "but not much improvement in business. People are still pretty cautious about spending money."



A standard preassembled control panel is provided with all Amplitrol feeders, and is ready for immediate service when external air and a-c power connections are made. Control can be local or remote, manual or automatic. Responds to any standard process instrumentation.

Now! A Mechanical Vibrating Feeder With Variable, Stepless Control

The exclusive Carrier Natural-Frequency drive, and a unique new amplitude control system — these two features of the new Carrier Amplitrol feeder give you benefits found in *no other vibrating feeder,* electromagnetic or mechanical.

LESS DAMPING. . . Amplitrol feeders increase vibrating stroke *automatically* when headload is increased. This allows you to use larger bin openings . . . bigger headloads . . . and to discharge bigger capacities of almost any material.

FULL-RANGE CONTROL . . . A new, highly simplified pneumatic system allows accurate, full-range stroke control. The heavy-duty air springs respond *immediately* to a pneumatic signal from a standard 0-80 psi air pressure valve. No lag.

LESS MAINTENANCE . . . Amplitrol feeders have no chains or v-belts . . . no large revolving weights or bearings . . . no auxiliary electrical parts . . . no gears or guards . . . NEW AMPLITROL FEEDERS ARE JUST THAT SIMPLE.

Send for new 12-page bulletin describing all Amplitrol benefits in detail. Carrier Conveyor Corporation, 221-A North Jackson Street, Louisville, Ky.

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Detroit— Chevrolet Motor Div., General Motors Corp., is battling time to get its pancake-engined small car to market by fall. It will win but not easily.

Major castings for the air-cooled engine are to come from the still unfinished aluminum foundry at Massena, N. Y., and from a shell mold line in the gray iron foundry at Tonawanda. Both operations were to be in production Dec. 1, 1958. Neither made it. Now, however, finned, gray iron cylinders are coming off the shell mold line at Tonawanda in pilot scale volume.

Current opinion is that the line could be in full production, but aluminum heads, crankcases, manifolds, pistons, and other engine parts are not coming out of the Massena foundry, although observers say that pilot runs could start on some of the permanent mold and diecasting machines by April 1.

It is said that except for the piston machines, Massena has been having trouble getting its permanent mold lines set up satisfactorily, and comparatively few diecasting machines have been installed. In addition, it is rumored that problems are being encountered in obtaining sufficient employees. Experienced workers find little attraction in mov-

Circle 686 on Page 53

DESULPHURIZATION...

LINDE's desulphurization method, for use with calcium carbide, is simple, efficient, and economical. The principal parts, shown here, are nitrogen supply, dispenser, and injection tube.

You get uniform results with Metallurgical Carbide from LINDE

In the foundry, you can produce high grade iron only by making sure you use metal with a low sulphur content. As a desulphurizing agent, metallurgical calcium carbide assures *uniformity* in the metal you produce. You know in advance that by adding a certain amount of carbide you remove a certain percentage of sulphur. Because metal specifications can be met efficiently and economically with carbide, you eliminate any need for wasteful "trial and error" methods.

Linde's method of mixing UNION calcium carbide and molten iron is simple and sure. A stream of fine mesh carbide and nitrogen under pressure is forced from a dispenser through a hose. The graphite injection tube is immersed deep in the hot metal. The carbide blends evenly and thoroughly with the iron. Desulphurization with UNION calcium carbide creates no fumes, does not attack refractories. The LINDE equipment—nitrogen supply, dispenser, and injection tube—is easy to operate and maintain.

If you would like more information about LINDE's method of desulphurization, using calcium carbide, just call or write your nearest LINDE office. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

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Circle 687 on Page 53

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ing from developed communities to the comparatively undeveloped area of Massena. And, inexperienced workers are scarce in the sparsely settled region. Getting into production by June as scheduled may be difficult.

In the meantime, it is rumored that Chevrolet is buying aluminum castings from outside sources so that some engines can be assembled for test purposes. The buying of aluminum castings from outside sources may be continued on a limited basis to assure castings for engine production until castings production at Massena starts and gathers momentum. As this happens, outside purchases could be dropped off gradually.

Machining of these castings reportedly is being done in Chevrolet's Tonawanda engine assembly plant. Last spring a large machine tool builder is said to have been commissioned to develop and install transfer equipment and fixtures and to rebuild and adjust used machines to handle aluminum castings. A few new machines also were installed.

Philadelphia—General improvement in metalworking is beginning to extend here to foundries. Gray iron and nonferrous shops report some pickup, and while malleable foundry operations show little if any gain, they are at least holding their own at a fairly good rate. Steel foundry business still lags, reflecting particularly the slow expansion in capital goods requirements.

Gray iron jobbers in the more immediate area are operating four to five days a week, or around an estimated 70 per cent of normal capacity. Working forces are still limited, but not as much as a few weeks ago. Most foundries either are taking back some men or are working longer hours. In the northern New Jersey area improvement in orders is slower.

As the case for some time, gray iron jobbers find light and medium work more active than heavy. Included in the former are power transmission parts, material handling components and pump and air compressor work. Orders for heavy castings are restricted by a continued lag in demand from machine tool and heavy

Circle 688 on Page 53

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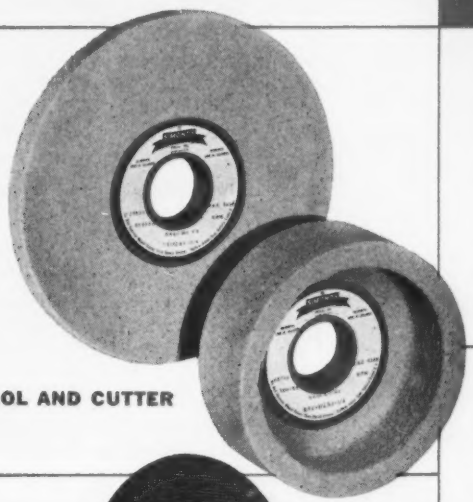
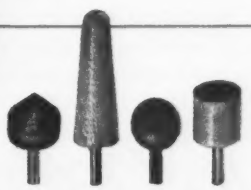
For Savings and Efficiency on ALL your grinding jobs

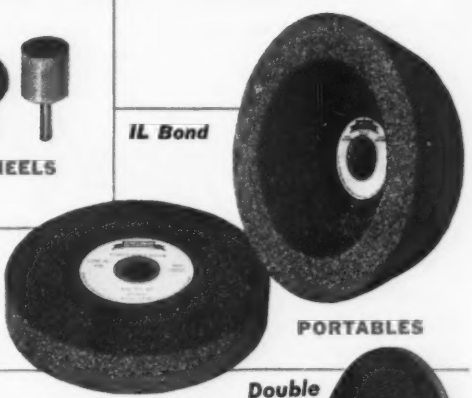
Grinding wheels for fast stock removal or micro-finishing! Toolroom wheels with new SA Borolon abrasive for improved cutting action! Portables with new IL Bond for longer wheel wear, better grinding! These, plus mounted wheels and fast long-wearing, non-burning cut-off wheels, are part of Simonds complete grinding wheel line — the line for consistently superior results with savings to match. Catalog bulletins on request.



TOOL AND CUTTER



MOUNTED WHEELS



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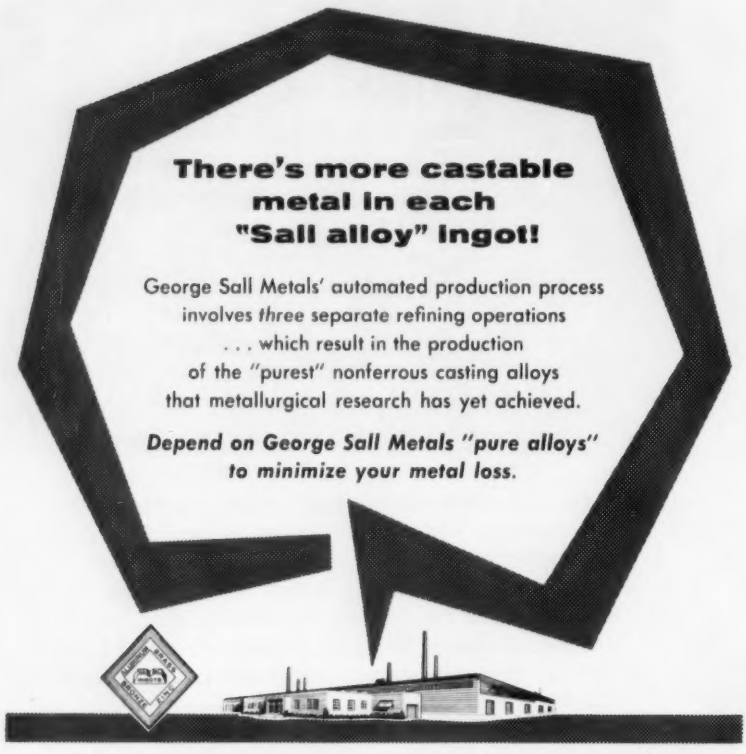
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"Sall alloy" ingot!
George Sall Metals' automated production process
involves three separate refining operations
. . . which result in the production
of the "purest" nonferrous casting alloys
that metallurgical research has yet achieved.
Depend on George Sall Metals "pure alloys"
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PRODUCERS OF: Aluminum alloy ingot, Brass and bronze ingot, Zinc base die casting alloys

Circle 690 on Page 53

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Choose any style chill nail from jumbo to stubby; slim, medium, or horse nail blade; blunt, pointed, straight or 90° bent. Same types available in Stainless, Brass, Aluminum; Copper coated to order. Spider Chills, jumbo or horse nail legs—double or single. Available in various sizes and types; also made to your individual specifications.
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industrial equipment builders.

Malleable shops note a steady demand for electrical equipment components, some gain in building hardware and in marine hardware, especially for small pleasure craft. Business in pipe fittings is good. Malleable consumers are pressing more for early shipments than was true a month or two ago. Producers regard this as encouraging but state that they have to do more in the way of juggling their schedules, setting up short runs, etc., to be competitive.

Steel foundries are operating three to four days a week, with backlogs slim at about two to three weeks. Jobbing demand is spotty, with relatively little heavy machine work and with ship work still confined almost exclusively to captive shops.

The upturn noted early in the year in the business of independent nonferrous shops continues, although still leaving room for substantial improvement. Demand for plumbing supplies, water meters, building hardware, and light household appliances is livelier. Captive shops are doing very well on industrial pumps and valves, ship machinery, and propellers. However, there is no noticeable overflow of tonnage which would help the job foundries. Most independent foundries are operating at least four days a week, and in some instances beyond. This is true not only of brass shops but also of aluminum foundries. Actually, the latter have sustained the better average all along, although it has been nip and tuck in most instances.

Grimm Foundry Co. Inc., Bound Brook, N. J., has been sold to Werblin Bros., metal dealers, Somerville, N. J., with the building being revamped for leasing, possibly as a warehouse. Most of the equipment was scrapped.

Thatcher Furnace Co., Garwood, N. J., has discontinued the operation of its foundry. For some time its requirements have been shifting more to weldments, and the company has found it cheaper to purchase, rather than produce, such castings as it needs. The foundry will be converted to other uses.

Boston— Gray iron foundries enter second quarter with meager backlogs. Jobbing shop schedules for April will approximate first quarter

Circle 691 on Page 53

LARGE...

OR SMALL...

there is a grade of **PENN-SAND** for every type of core

Regardless of size, metals poured or core process used, we can supply a grade of Penn-Sand to meet your most exacting requirements.

Whether you are pouring steel, gray iron or non-ferrous metals—whether you use core oil, bentonite, cold-set binders, the CO_2 process or make shell cores—Penn-Sand will help you produce better cores at lower cost.

The secret is Penn-Sand's perfect uniformity—which allows you to standardize your mixes. You save the time and money that would normally be spent changing mixes every time a car of sand is received.

Triple washing, multiple screening and rigid testing before shipment are responsible for the perfect uniformity of each grade of Penn-Sand—a uniformity maintained shipment after shipment after shipment.

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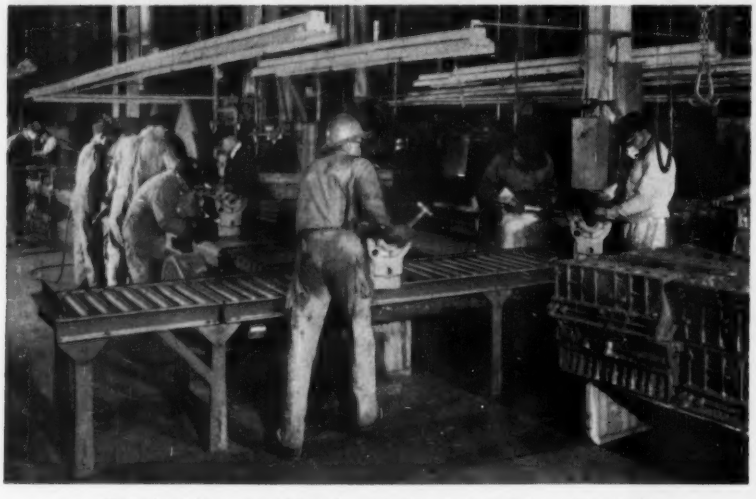
Ask Standard

how to cut costs with conveyors



Cylinder blocks are chipped, ground and inspected on Standard Roller Conveyor line.

Eastern foundry simplifies cylinder block handling with roller conveyors

HERE'S another installation in which Standard Roller Conveyors are keeping heavy, bulky components flowing to machining and assembly points with minimum manpower and practically no time loss.

Easy to set up and exceptionally sturdy, Standard Roller Conveyors (live or gravity) can also be job-tailored to your specific materials handling problem — permanent or temporary.

And roller conveyors are only one of the many types of Standard conveyors. Others include belt, slat, chain, pushbar or sectional conveyors as well as spiral chute systems.

Standard Roller Conveyors are available from stock in a wide range of roller diameters, centers and frames.

Call the Standard engineer listed in your classified phone book or write direct for Bulletin 68 — Address Dept. N-4.

Why not take advantage of Standard's half-century of conveyor application experience. Consult STANDARD CONVEYOR COMPANY. General offices: North St. Paul 9, Minnesota. Sales and service in principal cities.

operations, with three-week order book about average.

Approximately two-thirds of the New England shops are pouring five days a week but are below capacity for that rate. Most captive shops are operating five days and melt is heavier with textile mill equipment builders, although in only one case is the improvement substantial.

Demand from the machine tool industry drags, the bulk of casting orders being for light work. Demand for rough castings for highway drainage, catch basins and like volume is seasonally heavier and the potential for sustained requirements is encouraging. Inventories are low among industrial consumers, and most orders are for early shipment.

Malleable iron shops also are operating with small backlogs, but at a slightly higher rate than gray iron. This situation also holds for steel foundries, although the latter have reduced backlogs steadily in recent months. Prices are highly competitive in all types of iron castings.

Valve and fitting orders are improved slightly and most brass and bronze shops will maintain their recent level of melt in April; in a few cases operations may improve slightly. Valve demand from shipbuilders is well maintained.

Chicago— Standing on six sidetracks in the south yard of the Chicago Hardware Foundry Co. in North Chicago, Ill., are 37 steam railroad and electric interurban, elevated and street railway cars, some of which are museum pieces recalling a bygone era.

Twenty of the railroad cars are owned by the foundry company and three elevated cars are the personal property of F. J. Sherwin, its president. The remaining 14 are electric railway cars owned by the Illinois Electric Railway Museum, a group of about 48 Chicago and Milwaukee area men dedicated to preserving electric railway cars.

The latter group devotes its time and efforts to restoring to operating condition the transit carriers it has acquired. It is using the Chicago Hardware Foundry yard on a temporary basis, since it has plans for eventually maintaining its own operating museum at another site with a trackage of several miles.

The interest of Chicago Hard-

Circle 693 on Page 53

ware Foundry Co. in acquiring older railroad cars dates back about 20 years. The company uses some of the equipment in the conduct of its castings business. For example, a restored club car is used as a meeting place for its supervisory group and for entertaining visitors and customers. Gondolas are used to transfer scrap and pig iron; a high-sided car accommodates coke storage; several box cars are employed for storage of castings; a flat car finds use in unloading steel and materials of a bulky nature; and a caboose serves as the yard master's office.

The museum is open to the public on Saturdays only.

* * *

At a recent meeting of the industrial committee of the Chicago Association of Commerce & Industry, Harry F. Chaddick, head of Harry F. Chaddick Associates Inc., zoning consultants, announced that an additional 10,000 acres in Cook county may be zoned for industrial use soon, accompanied by strict performance standards to protect residential areas from noise and other nuisances.

Mr. Chaddick, who has been retained by the Cook county board of commissioners to prepare a new zoning ordinance for unincorporated areas, emphasized that new and tougher restrictions against noise, fumes, dirt, vibration, etc., will be a part of the code.

Recommendations will be presented to the board early in April, with public hearings to begin in May.

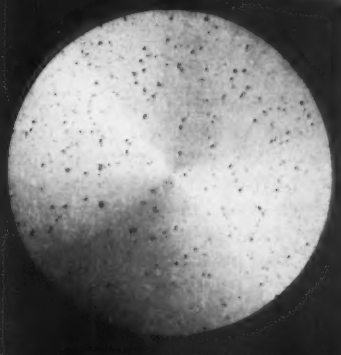
It is to be recalled that the recently adopted rigid zoning code for the city of Chicago becomes effective May 1.

Film Gives Information on Epoxy Tooling Resins

A 16-mm, sound-color film illustrates the speed, accuracy, and economy obtainable with epoxy tooling resins in step-by-step demonstrations. Laminating and casting of foundry patterns, metal forming dies, checking and assembly fixtures, and plastic die sinking models are shown. Film is available from Dept. 139, United States Gypsum Co., 300 West Adams St., Chicago 6, Ill.

Foseco COVERALS
AND NEW, HIGHLY EFFICIENT DEGASERS

ELIMINATE PINHOLE POROSITY AND OXIDES IN ALUMINUM CASTINGS, BILLETS AND SLABS . . .



Pinhole porosity which resulted with untreated aluminum alloy casting.

Pinhole porosity is eliminated completely when casting is treated with Foseco COVERALS and DEGASERS.

save time and materials

- Speedily remove hydrogen from all aluminum alloys
- Minimize oxidation
- Help remove dirt and non-metallics from the melt
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Efficient Foseco Coverals and *new* Foseco Degasers are available for use in all types of melting furnaces, and for treating *all* aluminum alloys.

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Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"I feel quite sure that we never are going to get rid of the need for the personal, man-to-man method of winning friends to foundry life"

Fresh Blood for the Foundry Family

● ONE OF MY many hobbies down through the years has been to quiz successful friends and acquaintances as to how they got started in their line of work. The answers so far wouldn't be very helpful to vocational guidance testers and counselors, for there seems to be little rhyme or reason to the incidents and circumstances that started these folks on their way.

If they had any one thing vaguely in common, it probably was an admiration for the personalities of certain neighbors, members of the family, professional attendants, teachers, or visitors which turned the trick.

I remember that when I was a kid, my Dad was tops to me. He still is in my memory. He was one of those fellows who brought his work home with him—not his complaints about it, but his interest in it and his enthusiasm for it. Shop talk held the center of the stage at our house, with us kids in audience—even Mom, who was raised in a shop family.

Most of our visitors were shop people, and no matter what subject opened a conversation, talk invariably was dragged or migrated around to shop people and shop problems, including victories against seemingly impossible odds. True to the old saying that "Little pitchers have big ears," I eavesdropped and began to learn the lingo and to try my hand in a fumbling fashion.

The Usual Pattern—When our out-of-town relatives (shop people on both sides) came for a week end or holiday visit, I had a pretty good idea as to what was going to happen. Pop would invite them for a walk (there were no autos), a walk which took them rather hurriedly past local points of general interest, but invariably led to the factory. Since I knew the pattern of these trips it would have been quite a chore to keep me from tagging along.

Pop would brag politely about the company and how well it was doing as he pointed to the new addition going up. All the while, he led the visitor to the real object of the trip—his department, his professional residence, the place where he spent most of his waking hours. With unmistakable pride, he showed off the actual examples of what he had been trying to explain. He pointed out the tough mechanical nuts he and his pals had cracked, in the face of being told "It can't be done"; examples of precise workmanship; and the new milling machine (very latest) installed the week before. All were displayed with sort of an implied "Match this if you can!" Pop went all out—sometimes, I'm afraid, over the guests' heads and beyond their patience but not mine.

Doc always tagged along on Sunday afternoons when Dad showed visitors his department at his plant

Old Louis Goetz, head of a pottery plant across the street from where I lived between ages 12 to 20, was another hero. Trying to be like him, I learned how to make pots on the potter's wheel and got the hang of the ways of clay. That knowledge, by the way, has come in darned handy at the Lee Hobby Foundry. All down through the years I have had crushes on durable heroes who left their marks on me and my ways.

Last week, I spoke to a large group of students at one of our leading universities. Arriving in plenty of time I ambled over to the foundry and found it empty—no students ramming and pouring away, and some $250,000 worth of top-notch equipment gathering dust.

Things Have Changed—I learned, with a tear in my eye, that hand

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. . . . . is a major ambition of all of us on the Hickman-Williams foundry sales and service team! In the better business months ahead, we are rolling up our sleeves in a big way to be sure that YOU are supplied promptly with the best materials at the right costs so you can get *your share* of the market for *quality castings.*

The opportunity will not be afforded to pin an H/W carnation on you at the AFS Convention this year but many of us will be present in person and will look forward to seeing you in Chicago the week of April 13.

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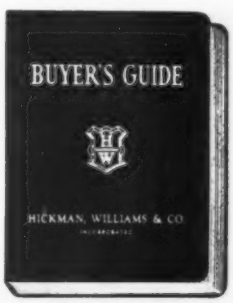
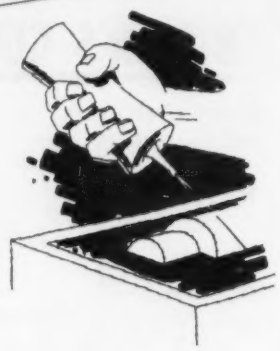


Do you have a copy of our new BUYER'S GUIDE? Our new 50-page three-ring binder gives complete detail on all of the products which we regularly supply to foundries. A request will bring a copy by return mail.

Circle 695 on Page 53

HOW To Do It

FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published



Molders Use Squeeze Bottle and Plastic Sheet

By H. DURWOOD BUTTS
Lynwood Custom Castings
Watertown, N. Y.

A PLASTIC squeeze bottle and a plastic sheet helped solve two problems in our foundry. The squeeze bottle used by our bench molder was obtained in a local five and ten-cent store and originally contained a liquid preparation for the hair. It is about 2 in. in diam and about 5 in. high with a 2-in. spout having a pinhole in the end. When filled with water, it makes a nice tool for wetting the sand around the perimeter of a pattern before drawing. The practice has reduced, considerably, the amount of fins on castings.

The plastic sheet is thrown over a newly cut sand heap to keep it from drying out. The cover also helps moisture to permeate the entire heap, producing uniform moisture distribution.

soiling and sand ramming foundry instruction has had to be pushed aside for greater emphasis on engineering principles, the study of which, I was told, is next to impossible once graduates have swung into their earning orbits. Wiping the tear from my eye, I saw one little ray of sunshine in plans being toyed with to use the foundry for coaching noncollege students recruited from industry, industrial art teacher training schools, and such. There's no question in my mind that the pendulum, as pendulums are in the habit of doing, will swing back to the foundry—maybe not as far, but certainly in the right direction.

Maybe I'm sticking my neck out again as an amateur, but I couldn't help wonder whether we temporarily have lost sight of the opportunity which surely must still exist for inoculating young fry such as sons, neighbors' sons, relatives, and others with the foundry fever on a piecemeal basis, one at a time, catch - as - catch - can, personalized, man to man.

Of course, those who leave the foundry every night with a sigh of relief would have a poor batting average in this direction. But I've met lots of them who, like Pop, truly are bitten by the foundry bug. Sparking an interest in others would come as second nature once they put their minds to it.

Occasional foundry visits by young people in sizable groups are grand, and the more the merrier, but even the best of them frequently leaves a picture that is sort of a hodgepodge—sometimes downright frightening.

I can imagine what a mess of red tape, guards, pass processing, and other barriers Pop would have to encounter were he alive today to attempt to take sons and other visitors into the works. But I'm not so sure the battle wouldn't be worthwhile in the long run, and I feel quite sure that we never are going to get rid of the need for the personalized, man-to-man method of winning friends to a foundry life.

The Wrong Complex—If we who are dedicated to this noble craft have any inferiority complex, we've got to get rid of it. We have to tell the young fry about the challenges and the opportunities foundry work holds for he-man pride of accomplishment and for membership in a wholesome profession. With young people floundering and at their wits' end trying to pick vocations, I honestly believe we can fill one large portion of our future personnel quota through such simple means, once we put our minds to it.

An order just came in over the phone for 28 castings. Fortunately I have the patterns and hard sand matches up in the loft (repeat order); so I had better get moving. Oh, yes—about 15 engineering students are due for a foundry shot in the arm at the Lee Hobby Foundry very shortly.

Employs Vacuum Metallurgy

Sigourney Mfg. Corp., South Acton, Mass., is employing vacuum metallurgy in the production of steel, cobalt, nickel, and nonferrous investment castings.

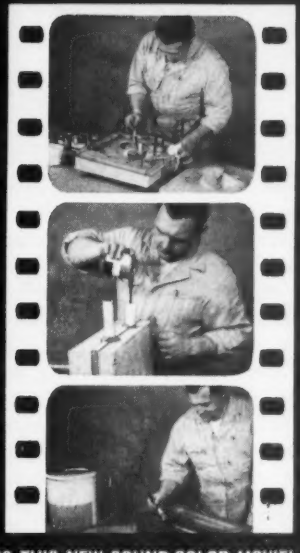
Circle 696 on Page 53→

3-dimensional reproduction

calls for specialized materials

EPOXICAL* Plastic Tooling Resins reduce time and costs as much as 50% in the fabrication of tooling and checking fixtures, dies, match plates, Keller and foundry patterns, and other industrial applications. For important savings, team up EPOXICAL resins with ULTRACAL* and HYDROCAL* Gypsum Cements.

Courtesy High Strength Plastics Corp., Chicago, Ill.



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WISCONSIN FOUNDRY CONFERENCE

. . . Offers Varied Program

By EDWIN BREMER,
ROBERT H. HERRMANN, and ERLE F. ROSS

● OVER 650 attended the 22nd annual Regional Foundry Conference sponsored by the Wisconsin Chapter, AFS, in co-operation with the University of Wisconsin at Hotel Schroeder, Milwaukee, on Feb. 12 and 13. The conference included 20 separate technical sessions, three general meetings, two luncheons, and the annual dinner.

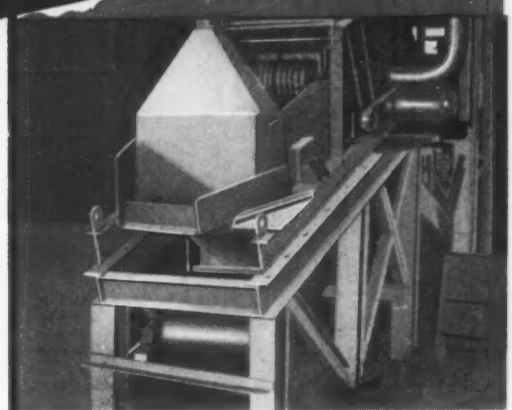
At the opening session Kurt F. Wendt, dean, College of Engineering, University of Wisconsin, pointed out that the foundry industry needs increasing numbers of technically trained men to staff important posts in operation, control, and research if it is to advance. It must be alert to improve product quality and design, reduce waste, and increase production per manhour of labor to meet economic competition.

Indicating the interest of the foundry industry in furthering the education of engineering students in the field, he mentioned that since 1947 the Foundry Educational Foundation has granted to students at the university 168 scholarships valued at $66,850 as well as two of the FEF-Wheelabrator, $1500 scholarships. Additionally, foundries and foundry organizations have supplied considerable equipment. In closing he said that educators are vitally interested in and concerned with progress in the foundry industry, and need and welcome support.

Lewis H. Durdin, Dixie Bronze Co., Birmingham, Ala., and national president, AFS, indicated that industrial progress is closely tied in with research activities. While accurate figures for the foundry industry are not available, it appears that research spending is about $1 for each $25,000 of productivity. In

Speakers, top to bottom, are Herbert J. Weber, AFS; Norman P. Lillybeck, Brillion Iron Works Inc.; Steve Denkinger, Shalco Corp.; Prof. Merton C. Flemings, MIT, and Charles K. Donoho, American Cast Iron Pipe Co. Photos by courtesy of Robert J. DeBroux, Milwaukee Chaplet & Supply Co.

SALVAGE YOUR VALUABLE MOLDING SAND with a SIMPLICITY RING-TYPE CRUSHER SCREEN



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You profit two ways with Simplicity's Ring-Type Crusher Screens

- Your used core and molding sand is crushed and screened for re-use in one operation, saving the cost of new sand.
- Transportation and dumping costs of used sand are eliminated.

This unit combines the Simplicity heavy-duty vibrating screen with free-turning cast rings mounted over crushing plates. One to three sets of rings can be supplied, depending upon the maximum lump size to be crushed.

Simplicity ring-type crusher screens are paying their way in foundries producing magnesium, steel, malleable and grey iron castings throughout the United States.

Available in many models and sizes. For complete information write today for the name of our sales engineer in your area; and turn your waste into profits.

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general industry it is $1200 for the same amount. Increase in productivity in the foundry field is 6 per cent as compared to over 43 per cent for industry in general. In view of those conditions Mr. Durdin called for more spending for research as a means of advancing the industry, and more particularly that the research efforts be co-ordinated to eliminate duplication, and to engage in those fields which will be of greatest benefit.

Session was concluded by Herbert J. Weber, director, Safety, Hygiene, and Air Pollution Control, AFS, discussing practical noise control. In some cases relatively simple means are available such as reducing the resonance of steel bins, boxes, etc., by lining with wood or rubber. Use of air mufflers on pneumatically operated devices will reduce noise. Clatter and noise from tumbling barrels can be lowered considerably by lining the interior with rubber or coating the exterior with undercoating material, or both. In some cases it is necessary to control noise by enclosing the operation or protecting the operator by placing him in an enclosure. Such enclosures must be designed carefully to obtain effective results.

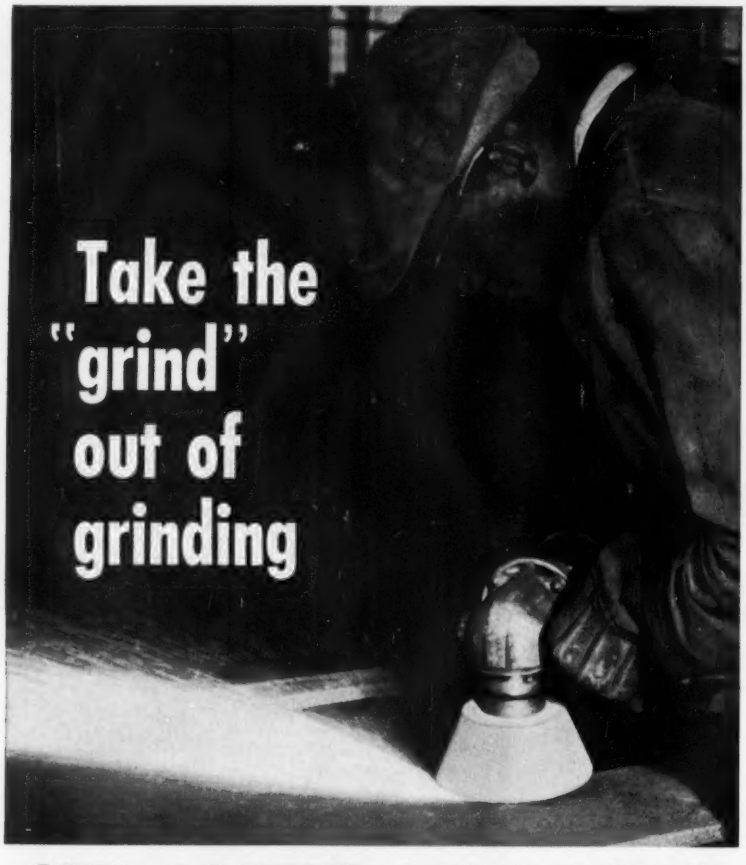
GRAY IRON SESSIONS

Effects of Steel Scrap in the Cupola Charge for Gray Iron, by N. P. Lillybeck, Brillion Iron Works Inc., Brillion, Wis. Required carbon analysis does not limit the amount of steel scrap since carbon absorption by the iron during melting can be promoted in various ways. Advantages of high steel scrap additions include low phosphorus content, greater freedom from tramp or residual elements, increased pearlite stability, increased response to hardening agents, and higher impact strength.

Increased steel in the charge causes a depletion of graphite nuclei which must be offset by heavier inoculation to avoid serious degradation of the microstructure. Coke requirement is much greater with high steel charges, and refractory consumption is higher. Control problems are magnified to the extent that improvements in equipment and operating technique are necessary to maintain quality levels. Usually the over-all material cost is higher in the case of the high steel scrap charge, but frequently it can be offset by savings in alloying agents when producing alloy irons in volume.

Solidification and Risering of Gray Iron Castings, by Prof. Merton C. Flemings, Massachusetts Institute of Technology. Conclusions of 8 year research on solidification and risering of gray iron castings were presented. The more recent work indicates no evidence to suggest that microporosity affects shrinkage behavior. However, hydrogen from water vapor can produce large scale porosity, but this differs from shrinkage. Volume changes of castings have been related to carbon and silicon contents. Agreement has been found between predicted and measured values of shrinkage. Also volume changes have been linked to heat-flow analyses, permitting comparison of measured and theoretical curves of shrinkage vs. time.

There is some evidence that an expansive force occurs during solid-



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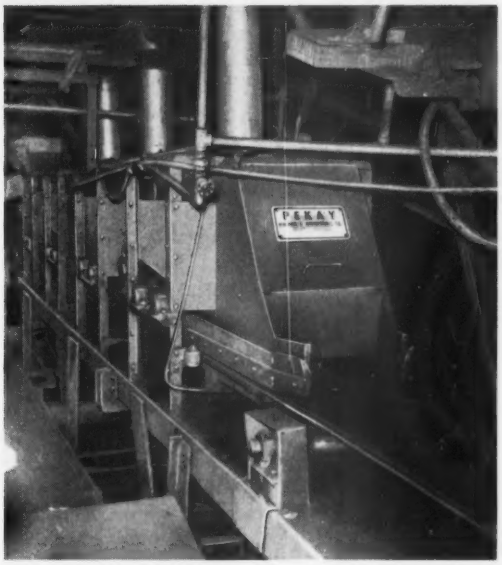
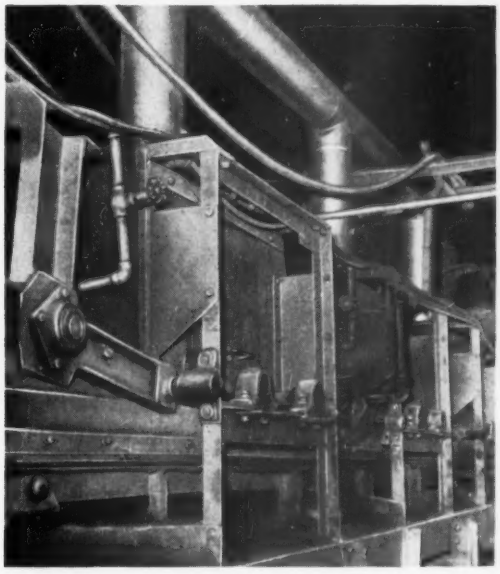
DO YOU NEED MORE SAND?



Buffalo Pipe and Foundry Corp., Buffalo, N. Y., is currently getting 120 tons of molding sand per hour with this Pekay Mixer Muller installation. As indicated in the photo below, this Pekay equipment is installed directly on existing conveyor belt frames without additional support.



Get Up To 85% More Over a Single Weekend With a PEKAY MIXER MULLER

A PEKAY MIXER MULLER used in conjunction with your existing sand preparation equipment—permits production increases of up to 85% of a high quality molding sand—the required unit is normally installed on a weekend.

Many foundries operate Pekay Mixer Mullers independently of other preparation equipment. The cost is low. For example, a unit delivering 100 tons of sand per hour requires an *initial* investment of only $125 per ton of output. This low first cost drops even more—to about $80 per ton of output—in the larger 300 ton per hour units.

But regardless of how they are used—either as supplementary equipment or as independent units—Pekay Mixer Mullers are guaranteed to produce a uniformly high quality sand. And once installed, Pekay Mixer Mullers keep running day in, day out with an absolute minimum of maintenance. They are designed and built to last.

If you need additional sand capacity—quickly and economically—contact a Pekay engineer. He will be able to point the way to true operational efficiency at a fraction of the standard cost.

PEKAY MACHINE & ENGINEERING CO. INC.

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☐ Pekay Sand Systems ☐ Pekay Airators

☐ Pekay M-T-Matic Buckets

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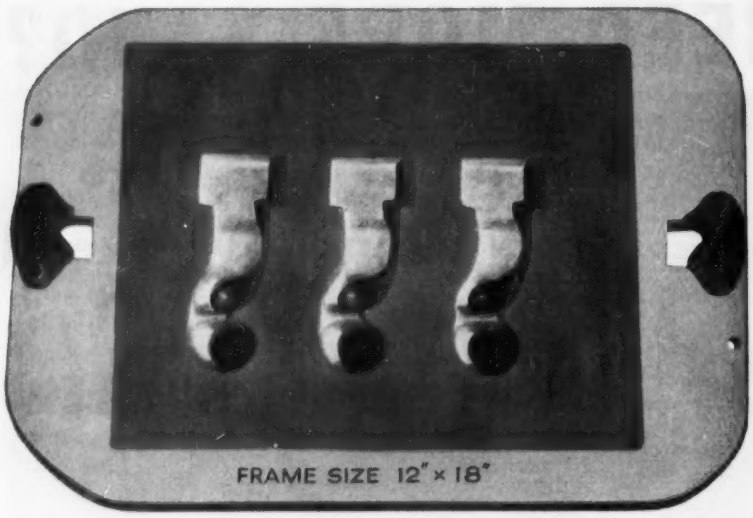

"The type of work we produce in TAMASTONE we would be unable to make at all in the absence of skilled help!"

COLUMBUS BRASS & ALUMINUM CO., INC., Columbus, Indiana

This Drier equipment pattern is for a port core box on a diesel engine and is made from an original master pattern. *Only one shrinkage!* Material is aluminum. Pattern was used for 100 Driers. Only 2 hours labor and 20 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

No special skill needed to increase production 400% or more! . . . WRITE . . .

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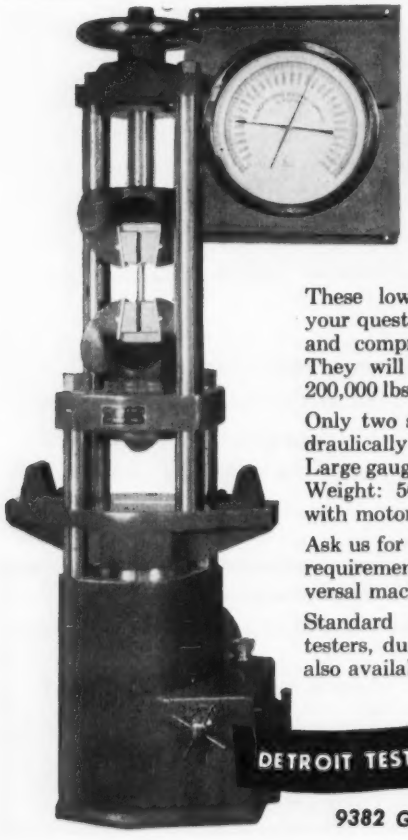

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These low-cost machines will answer all your questions about the tensile, transverse, and compression strength of metal parts. They will apply up to the equivalent of 200,000 lbs. per sq. inch (on a .505 specimen).

Only two simple controls operate these hydraulically powered, automatic machines. Large gauge gives accurate reading instantly. Weight: 500 lbs., height: 4'-4". Equipped with motor, gauge, grips, and blocks.

Ask us for more information or send us your requirements for a quotation, as this Universal machine can be modified many ways.

Standard and special Brinnel hardness testers, ductility testers, and tensile testers also available.

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ification of gray iron. The force has been related indirectly to graphite structure.

From a practical point of view, irons cast in dry-sand molds need little or no risering. The riser need remain liquid only during the proeutectic stages of cooling and solidification. Green sand castings require a greater volume of feed metal during a later stage in solidification. However, large risers frequently are ineffective for feeding hypoeutectic irons cast in green sand. Large risers may complicate and exaggerate the thermal problem. Small, externally heated or well insulated risers have been found effective.

Using numerous slides to illustrate various phases of his discussion on **Producing Good Ductile Iron**, Charles K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala., stated that the quality of the iron depends upon base iron composition, magnesium content level, and final inoculation. Properties obtained in the as-cast and heat treated irons were given, and compared with competitive materials. Magnesium additions to the base iron affect the properties and graphite form in the resulting ductile iron, and the effects of too little, the optimum, and too much magnesium were depicted in slides. Mr. Donoho suggested a method of classification for spherulitic graphite and transitional graphite forms, and described some types of ductile iron castings produced at his plant.

Hot Blast for Improved Cupola Operation, by Dan E. Krause, Gray Iron Research Institute Inc., Columbus, Ohio. Anything that improves the reaction in the melting zone of the cupola improves the operation. Hotter iron is produced, and this often is desirable to reduce impurities and to give less chill effect. Hot blast provides a more fluid slag and gives cleaner melting.

Increasing the temperature in the melting zone can be accomplished by the use of oxygen, using a dry blast, using higher carbon coke, and adding calcium carbide. With hot blast, it is frequently possible to charge lower cost metallics. Some other advantages of hot blast are a better melting rate, faster recovery after shutdown, lower manganese losses, and better recovery of

For Longer Lining Life Use . . .
WALSH Missouri-Quality REFRACTORIES for the FOUNDRY INDUSTRY

FIRE BRICK

Brand	Type	Fusion Point	Uses
WARCO XXT (Missouri High Heat Duty)	Dealred Stiff Mud	Cone 32-32½ (3137° F.)	An extremely dense, hard product for lining metallurgical furnaces where slag and abrasive action is severe. Such as cupola linings malleable furnace side walls and ladle linings.
BUNG BRICK (Missouri Super Duty)	Dry Press	Cone 33-34 (3200° F.)	Malleable furnace roofs.
MULLITEX (Missouri Super Duty)	Dry Press	Cone 33-34 (3200° F.)	Furnaces operating at high temperatures with sudden temperature changes. Malleable furnace bottoms and roofs, non-ferrous furnace lining, aluminum remelting furnaces, sidewalls and crowns.
MULLITEX HB (Missouri High Burn Super Duty)	Dry Press	Cone 33-34 (3200° F.)	Highly resistant to slag and sudden temperature changes. Hearths of aluminum remelt furnaces. Desulphurizing ladle linings—cupola walls.
WARCO D (Intermediate Duty)	Dealred Stiff Mud	Cone 30-31 (3000° F.)	Grey iron and electric furnace steel ladle linings, patching brick, runners, spouts.

Walsh also makes: Cupola Blocks, Tap Out Brick, Slag Hole Block, Ladle Bottoms, High Temperature Ferrous and Non-Ferrous Furnace Linings.

PLASTICS

Brand	Max. Service Temp.	Fusion Point	Packaging	Type	Uses
GRAFLOK (Missouri Super Duty Graphitized Plastic) (Wet or Dry)	3000° F.	Cone 33-34	100 lb. cartons 100 lb. bags	Heat Setting	For lining bull ladles, spouts, runners, cupola wells, and front slagging spouts.
K-11 PLASTIC (Wet or Dry)	3200° F.	Cone 36-37	140 lb. drums 400 lb. drums	Air & Heat Setting	Rammed linings in fluxing ladles, burner ports, and blocks, electric furnace linings, brass melting furnace linings.
BB 161 PLASTIC (Wet or Dry)	3200° F.	Cone 33-34	100 lb. cartons	Air & Heat Setting	For lining foundry holding ladles, bull ladles, spouts, runners.

CEMENTS

Brand	Max. Service Temp.	Fusion Point	Packaging	Type	Uses
MORT AIRSET (Wet or Dry)	3000° F.	3100 deg.F.	100 lb. bags 200 lb. drums 500 lb. drums	Air & Heat Setting	For laying up fire brick subjected to severe joint erosion, patching, wash coating.
METALOK (Missouri Super Quality Mortar—Dry)	3200° F.	3000 deg.F.	100 lb. bags	Heat Setting	Unusually resistant to slag action—highly suitable for laying up fire brick in malleable furnace sidewalls, ladles, hot metal mixers, electric furnaces.

Walsh also supplies the Foundry Industry with ground fire clays and fire brick, gun mix, super duty plastic fire brick, and castables, graphitized clay coatings and other refractory specialties.

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FACTORIES: ST. LOUIS AND VANDALIA, MISSOURI

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GET SET FOR
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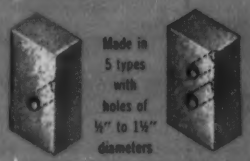
TAPPING

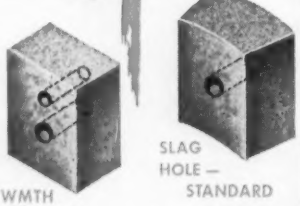
with IRONTON TAP HOLES, SLAG HOLES AND SPOUT BRICK for CUPOLAS



STANDARD TAP HOLES

SPOUT BRICK

Quick, easy way to perfect flow. Just set in place for a one-piece lining. Eliminate joints, save "burning in." Two types—straight or with hole for vertical drop.



PROMPT DELIVERY FROM OUR LARGE STOCK OF STANDARD SIZES OR WE WILL MAKE TO ORDER

SINCE 1917 THE IRONTON FIRE BRICK COMPANY IRONTON, OHIO

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Write or call Ironton 109 for the name of nearest representative.

Circle 703 on Page 53

charged materials. Hot blast is very advantageous for the basic cupola which requires higher operating temperatures.

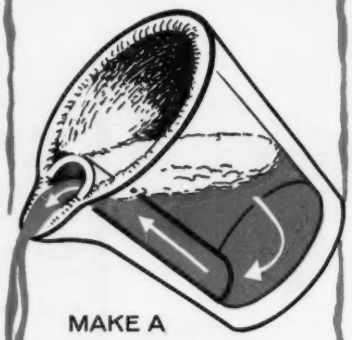
STEEL SESSIONS

Recent Developments in Sand Testing with Reference to Steel Castings, by Victor M. Rowell, Harry W. Dietert Co., Detroit. Two steel molding sands were compared: One was a narrow grain distribution sand with a grain fineness number of 70; the other had a grain fineness number of 74 with broad distribution. Tests showed the broad grain distribution sand to be highest in density, green compressive strength, green tensile strength, dry compressive strength, hot strength, and glazing ability. It was lowest in permeability and rate of expansion and superior in spalling resistance. Use of a broad grain sand minimizes the need for silica flour in the mix. Use of such a sand, however, requires care in avoiding grain segregation.

In a panel discussion on **Steel Castings Can Be Made in Shell** the participants included Joseph R. Vinette, Evinrude Division, Outboard Marine Corp., Milwaukee; Erwin G. Tetzlaff, Pelton Steel Casting Co., Milwaukee; James A. Behring, University of Wisconsin, Madison, Wis., and Donald J. Koch, Sivyer Steel Castings Co., Milwaukee. The speakers pointed out that the shell molding process is being employed to produce steel castings ranging in weight from ¼ oz to 200 lb. Silica and zircon sands are being used, and the resin content averages around 4½ per cent for silica sand although it may be as high as 6 per cent. With zircon

"Have Fintz put some sand in his pockets for ballast"

POUR SLAG-FREE CASTINGS



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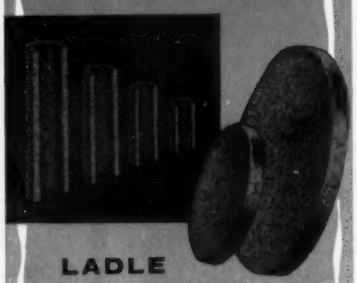

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Circle 704 on Page 53

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These dusts include aluminum, borax, carbon, cement, charcoal, coke, flour, glass, grain, graphite, gypsum, limestone, pollen and wood. While used throughout industry, the R9100 is particularly popular in foundries.

The R9100 weighs only 2 ounces. IT IS THE LOWEST COST, B OF M APPROVED RESPIRATOR ON THE MARKET. (Costs about ½ the price of other approved dust respirators.) It can be cleaned for re-use time after time by a shaking, a slap of the hand or by a light blast from an air hose. Easy to breathe in — low resistance exhalation valve will not stick. May be worn with goggles.

DOUBLE SCREENS on this AO Dust Goggle are an "Iron Curtain" against Dusts!

This AO 316 Dust Goggle protects the eyes of your workers against dusts by means of a 150 mesh inner screen set behind a 16 mesh screen. The goggle is a companion model to the AO 315 FOUNDRY GOGGLE. It is regularly supplied with soft plastic mask (leather available). Edges of sponge rubber, corduroy-bound. Super Armorplate clear or Calobar lenses in medium, dark or extra dark shades. Goggle provides maintained perfect fit over most types of spectacle glasses.

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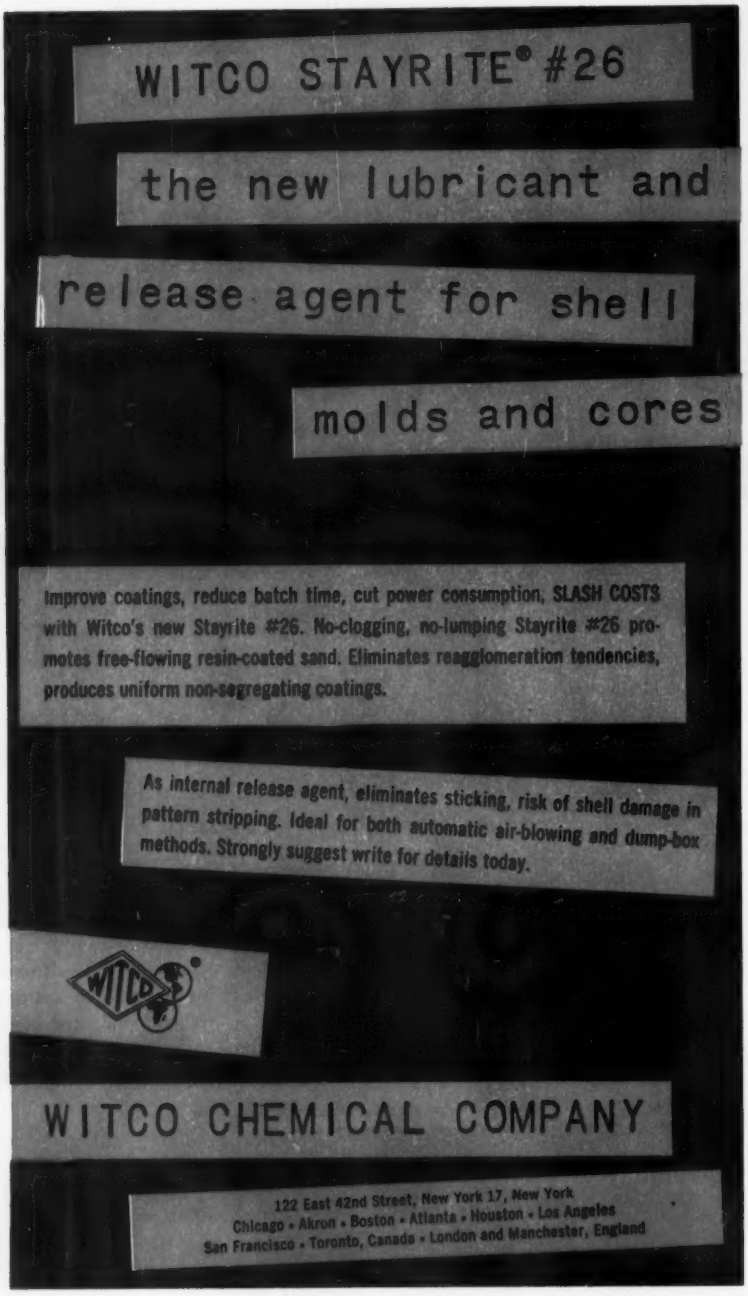
Circle 705 on Page 53

sand the resin binder is about 3½ per cent. Good feeding of castings is essential, and rapid pouring is necessary to obtain good surface finish. Pouring temperatures in the range 2940 to 3100° F seemed to have little if any effect on obtaining good surface finish.

Advantages of Casting Design To Develop Highest Service Strength, by John B. Caine, foundry consultant, Cincinnati. Design is a more important influence on load-carrying ability of castings than the alloying and heat treatment of the metal used. A slight design change can increase load-carrying ability by 50 per cent at practically no increase in cost. In contrast, an increase of 5 to 10 per cent in load-carrying ability by metal treatment can be quite costly. Design has not been considered a function of founding, and in its fullest meaning still is not. However, foundrymen can help everyone if they will become specialists in one small field of design, that of connecting members and junctions of cast sections. The designer does not have time to attend to this subject, and it needs attention.

How To Extend Electric Furnace Roof Life and Cut Costs, by C. E. Grigsby, General Refractories Co., Philadelphia. Most satisfactory results are obtained by cutting and shaping the refractories to obtain close fits rather than to fill the spaces between bricks with mortar. Heating of refractories when placed in operation should not be too rapid so that a uniform temperature gradient from operating face to back of the refractory is established. That permits the refractory to make gradual adjustment to the expansion developed during the transformation of quartz to cristobalite. It also was suggested that thinner or smaller refractory shapes give better results since they permit more uniform heat penetration.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Improve coatings, reduce batch time, cut power consumption, SLASH COSTS with Witco's new Stayrite #26. No-clogging, no-lumping Stayrite #26 promotes free-flowing resin-coated sand. Eliminates reagglomeration tendencies, produces uniform non-segregating coatings.
As internal release agent, eliminates sticking, risk of shell damage in pattern stripping. Ideal for both automatic air-blowing and dump-box methods. Strongly suggest write for details today.
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MALLEABLE IRON SESSIONS

CentraSteel—a High Modulus Graphitic Steel, by W. B. Larson, Dr. R. F. Thomson, and F. J. Webbere, Research Laboratories, and Carl F. Joseph, Central Foundry Division, General Motors Corp. Presented by Mr. Larson. This material is produced by inoculating a low carbon, high silicon base iron with small amounts of boron and tellurium. Preferred composition shows 1.70 per cent C, 2.25 per cent Si, 0.40 per cent Mn, 0.10 per cent S, 0.05 per cent P, and 0.01 per cent B. The material resulted from a research program for a means of producing as-cast malleable iron. One characteristic is the presence in the as-cast state of a compacted form of graphite similar to temper carbon in malleable iron. Another is its high modulus of elasticity of 28,000,000 psi, approaching that of steel.

Material is reported to possess the strength of steel with superior machinability. It may be used in the as-cast condition, but by simple and short heat treatment a wide range of properties may be secured.

New Developments in Water-Cooled Cupolas, by Harold Schwengel, Modern Equipment Co., Port Washington, Wis. Several photographic slides showed a number of water-cooled cupola installations. Such a cupola was described as one with no refractory in the melting

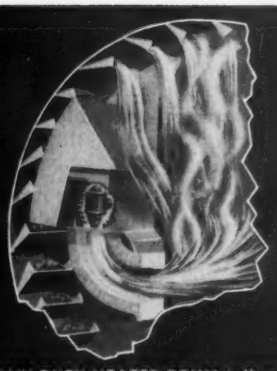
STOP PAYING FOR EQUIPMENT YOU DON'T HAVE

The HEATALL has no equal for heating efficiency and economy!

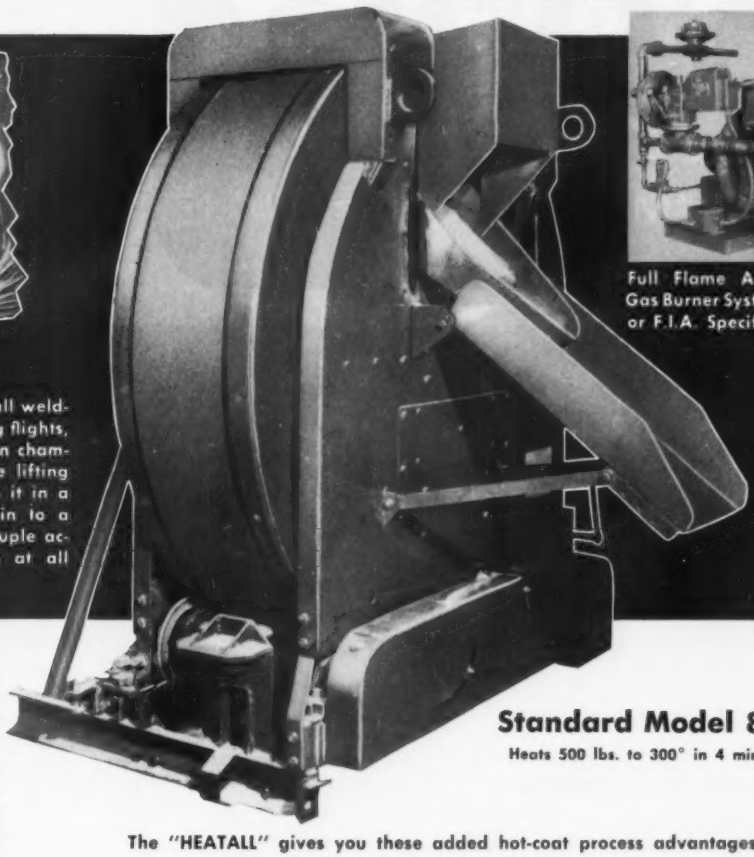
FOUNDRIES FIND HEATING OWN SAND IS EASIER, FASTER, MORE PROFITABLE

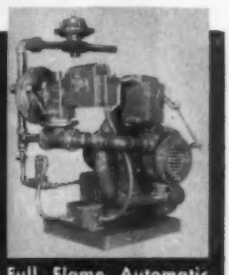
with the

MODEL 805 *Heatall*



HEAVY-DUTY HEATER DRUM (all welded construction) contains lifting flights, burner system, and combustion chamber. As the drum rotates, the lifting flights lift the sand and drop it in a thin veil, exposing each grain to a blast of hot gasses. Thermocouple accurately records temperature at all times.





Full Flame Automatic Gas Burner System. F.M. or F.I.A. Specifications.

Now *all* foundries can efficiently and economically heat their own sand for the hot-coat process. The reason: The model 805 "HEATALL" shell sand heater. Easily installed beside any conventional muller, the "HEATALL" discharges the heated sand into the muller. The hot-coating process cuts down your cycle to *5 minutes or less.*

Standard Model 805

Heats 500 lbs. to 300° in 4 minutes

The "HEATALL" gives you these added hot-coat process advantages:

- Coated Sand at Lower Cost.
- Higher Tensile Strength — Less Resin.
- Free-flowing, Lump-free, High Quality Coated Sand.
- Coated Sand "Tailored" To Your Specifications, Melt Point, and Tensile Strength Requirements.

For full particulars write:

AVAILABLE IN LARGER MODELS UP TO 2500 LB. BATCHES

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Engineers and Builders of Automatic Foundry Equipment

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AFFILIATED WITH Barber-Greene

zone, uses carbon lining in the well, is cooled with water applied to the outside of the shell, and has protruding, water-cooled tuyeres. Advantages are operational flexibility through use of a basic, acidic, or neutral slag; good control because the uncontrollable influence of refractory lining is eliminated; prolonged periods of melting are possible, and decreased costs for refractory and maintenance.

Economies achieved by several foundries through the use of water-cooled cupolas were discussed.

Porosity in Malleable Iron, by Clifford R. Sorensen, National Malleable & Steel Castings Co., Cicero, Ill. Pinhole porosity in malleable castings apparently results from different causes than the same defect in steel castings where it is largely a melting problem. Many changes have been made in the malleable charge without reduction of the problem.

A literature search reveals that pinholes are caused by many things. There is a reaction type of pinhole. Sea coal up to 10 per cent in the sand is claimed to eliminate pinholes but the speaker has not been able to prove this. About 150 sand and bonding combinations were tried but that provided no solution. Bonding materials were changed, but without success.

Mold moisture is a "hot potato." It is not known how this affects the production of pinholes, but it apparently does. There is a belief that pinhole-free castings can be made with use of bentonite bonded sands. There still are problem castings, but it usually is possible to solve these by changing the clay bonding.

Continuous Annealing, by L. E. Emery, Marion Malleable Iron Works, Marion, Ind. A new installation for continuously producing pearlitic malleable and high strength, grade 35018 malleable iron was described. Equipment includes a split electrically heated furnace 220 ft long for producing ferritic malleable. Material to undergo treatment for production of pearlitic malleable is removed from the first section of that furnace, rapidly air quenched, and subjected to drawing or tempering in a gas-fired furnace.

PATTERNMAKING SESSIONS

The Use of Plaster and Gypsum Cements in the Pattern Shop, by Melvin K. Young, United States Gypsum Co., Chicago. A variety of gypsum cements, commonly called plaster of paris, were discussed. Broadly speaking they may be divided into soft or hard plasters and those with average or high expansion characteristics. The proper handling, storage, and mixing, and the making of patterns, checking fixtures, and molds for metal and plastic patterns were covered.

New Horizons in Pattern Life Extension, by J. E. Olson, Dike-O-Seal Inc., Chicago. Recent experimental work conducted by the company was discussed. It was pointed out that abrasive action reduces pattern and equipment life, and materials for reducing that type of wear were described and illustrated. A coating for aluminum coreboxes, flask edges, and other points of high wear was demonstrated.

Patterns for Malleable and Steel

HAWLEY

Trav-L-Vent

"Moves with the job"

eliminates big, expensive area ventilating systems

exhausts toxic fumes at any pouring point

NEW! *First and only* real solution to non-ferrous foundry ventilating problems. This mobile ventilator attaches to bail of any ladle . . . traps and exhausts harmful fumes during pouring operation. Protects workers... eliminates "zinc shakes" and other health hazards . . . improves working conditions.

HAWLEY TRAV-L-VENT has same lateral and lengthwise travel as any bridge crane . . . installs at less than ⅓ the cost of inefficient conventional systems . . . uses as little as 1500 cfm. Proved in operation at such foundries as Ford Meter Box Company, Allis Chalmers, Langsenkamp-Wheeler, Hersey Manufacturing Company, Northern Indiana Brass, Robertshaw-Fulton and many others. *Will fit your foundry layout.*

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Gilson 100 lb. Core Sand Mixer for mixing sands

for cores made under the CO_2 process

This handy unit can be set anywhere in the shop and plugged into the nearest light socket. It is powered by a 1 h.p. electric motor, which is powerful enough to mix an average batch of sand in about three minutes. Prepared sand is discharged easily into portable hopper which is set below the mixer. Hopper is provided with a cover to keep mixed sand moist for many hours. After each mixing, drum and paddles can be cleaned in a few seconds. The GILSON MASTER MIX 100 LB. CORE SAND MIXER, designed especially for mixing sands for cores made under the CO_2 process, is also ideal for production runs on small cores and larger cores in jobbing foundries.

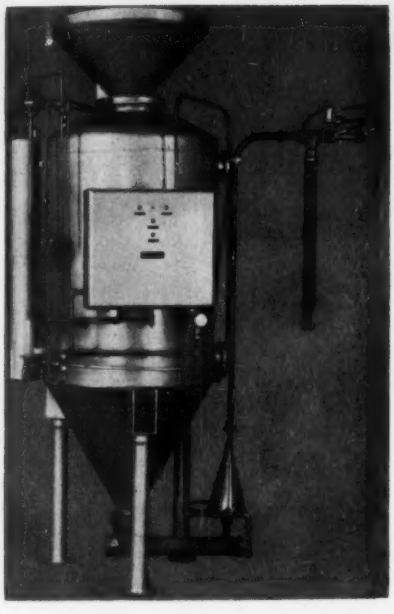
GILSON MFG. CO.
OOSTBURG, WISCONSIN

Circle 709 on Page 53

Revolutionizes Sand Systems

the
HARTLEY
BOND FEEDER
- MEASURES
- TRANSPORTS
SPEEDS-UP

Hartley,—originator of automatic moisture controls for sand systems, invites inquiries on its newest development illustrated here. Hopper sizes start at 28 cu. ft. Bond is transported to mixer in precisely measured quantities which can be changed instantly. May be located at floor level, or below, any distance from mixer. Ideal for multiple mixing units operating from same hopper.



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FORWARD DUMP BARROWS for FOUNDRIES

No. 102-A Barrow. Single steel wheel with 2" face, 16" diameter and 12 spokes.

No. 113-A Barrow. Two steel wheels with 2" face, 18" diameter and 10 spokes.

Here are two well-balanced charging Wheelbarrows for heavy duty foundry service. Handle loads up to 1000 lbs. Sturdy, welded, all-steel construction. Single wheel or double wheel. Available with zero pressure cushion type wheels or 4 ply pneumatic tired wheels with roller bearings. Immediate shipment.

Write for literature.

STERLING NATIONAL INDUSTRIES, Inc., Milwaukee 14, Wis., U. S. A.
Founded 1904 as Sterling Wheelbarrow Company

Sterling FOUNDRY EQUIPMENT

A-5792-1/3R

Foundries, by Joseph M. Kreiner, National Malleable & Steel Castings Co., Cleveland. Standardization of pattern and corebox equipment for high production malleable and steel foundries should begin with the preparation of complete construction drawings, including shrinkage allowance, for all components. This permits any pattern shop to make components which will be interchangeable with those made by other shops. Pattern equipment can be made economically in quantity and adequate stocks of patterns maintained for quick expansion of castings production or replacement of damaged production patterns.

Also, the castings produced will be interchangeable even though they may be made by outside foundries. Such a standardized system is justified only for a large volume, long extending design for castings such as those used in the freight car coupler described in this paper.

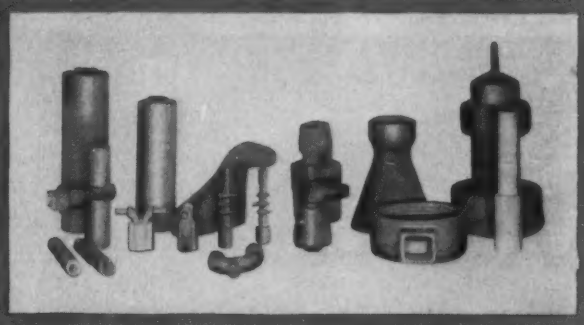
New Profit Horizons with Plastics, by Bruce Ferguson, Allis-Chalmers Mfg. Co., Milwaukee. The company's plastic department was formed in February, 1957, to make new patterns and duplicate pattern equipment, to replace worn patterns, and to make complex pattern design changes. It has expanded into production of tooling fixtures, product parts, prototype designs, electrical assemblies encapsulation, maintenance work, protective coatings, and dielectric dryers. A film showed the production of patterns, coreboxes, fixtures, models, and prototypes by pouring and laminating techniques.

NONFERROUS METAL SESSIONS

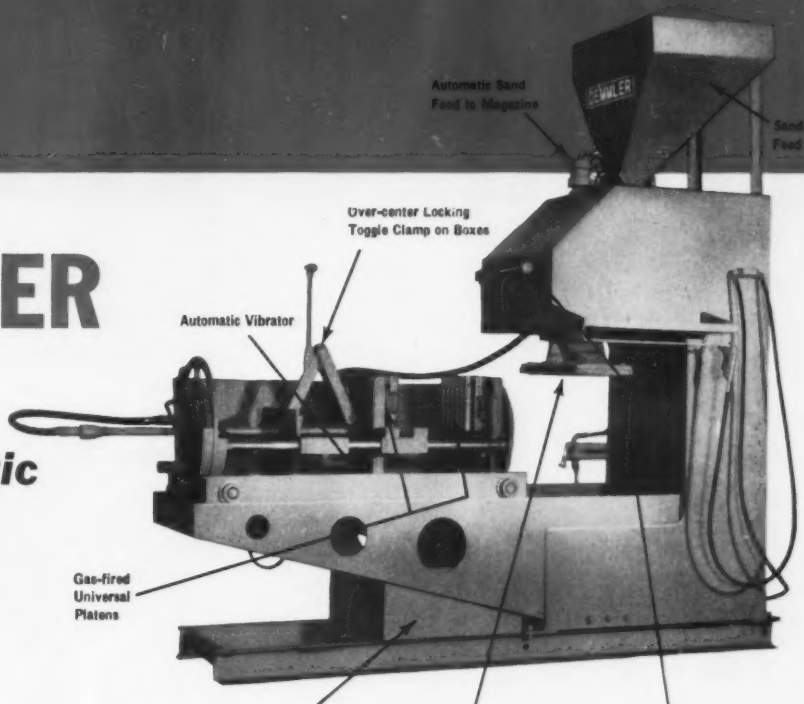
Shell Cores in the Small Foundry, by Steve Denkinger, Shalco Corp., Pewaukee, Wis. What will shell cores do for the small foundry, or why use shell cores? The biggest advantage is a lower core cost. Using a heated corebox, production is faster and all cores are the same. Castings require less cleaning and less coreroom area is required.

Aluminum coreboxes will get a foundry into the shell core field. It is cheaper to go into a shell core than a sand core when dryers are involved. Specially trained people are not needed to make shell cores in the small foundry. Materials are

NOW—a low cost true shell core blower of rugged Demmler quality for only $1995.00... shipping wt. 1500 lbs.



Typical cores suitable for production on the "Utility" shell core blower.


Automatic Sand Feed to Magazine
Sand Mix Feed Hopper
Over-center Locking Toggle Clamp on Boxes
Automatic Vibrator
Gas-fired Universal Platens
Screened Drain-Back Hopper
Field-proven Demmler Blow System
Master Control Valve with Safety Interceptors

DEMMLER

"Utility"

Semi-Automatic

Shell Core Blowers

OPERATING FEATURES:

1. Sand fed automatically from feed hopper into blow magazine. Hopper can be replenished without stopping production.
2. Over-center toggle lock for positive box closing and opening.
3. Master control lever shuttles box under blow head, clamps it, blows, unclamps and shuttles box to rollover drain position.
4. Rollover designed so that weight of boxes remain within the radius of rotation . . . no out of balance weight to struggle with.
5. Vibration applied to boxes automatically in rolled-over drain position for consistency of core wall thickness.

MODEL # 121015—VRD

Max. Box Size	12"x 10" x 15" Deep
Max. Core Weight, before draining	20 lbs.
Sand Feed Hopper Capacity	250 lbs.
Price, FOB Kewanee, Illinois	*$1995.00

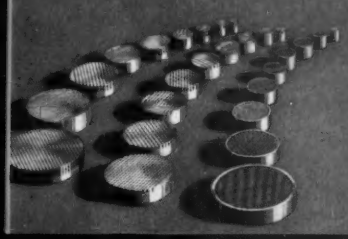
*Price includes quality blow-off gun and spray gun.

MODEL # 242030—VRD

Max. Box Size	24" x 20" x 30" Deep
Max. Core Weight, before draining	80 lbs.
Sand Feed Hopper Capacity	1000 lbs.
Price, FOB Kewanee, Illinois	*$4990.00

*Price includes quality blow-off gun and spray gun.

DEMMLER MANUFACTURING COMPANY • KEWANEE, ILLINOIS



PRECISION CORE BOX VENTS

Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

Circle 712 on Page 53

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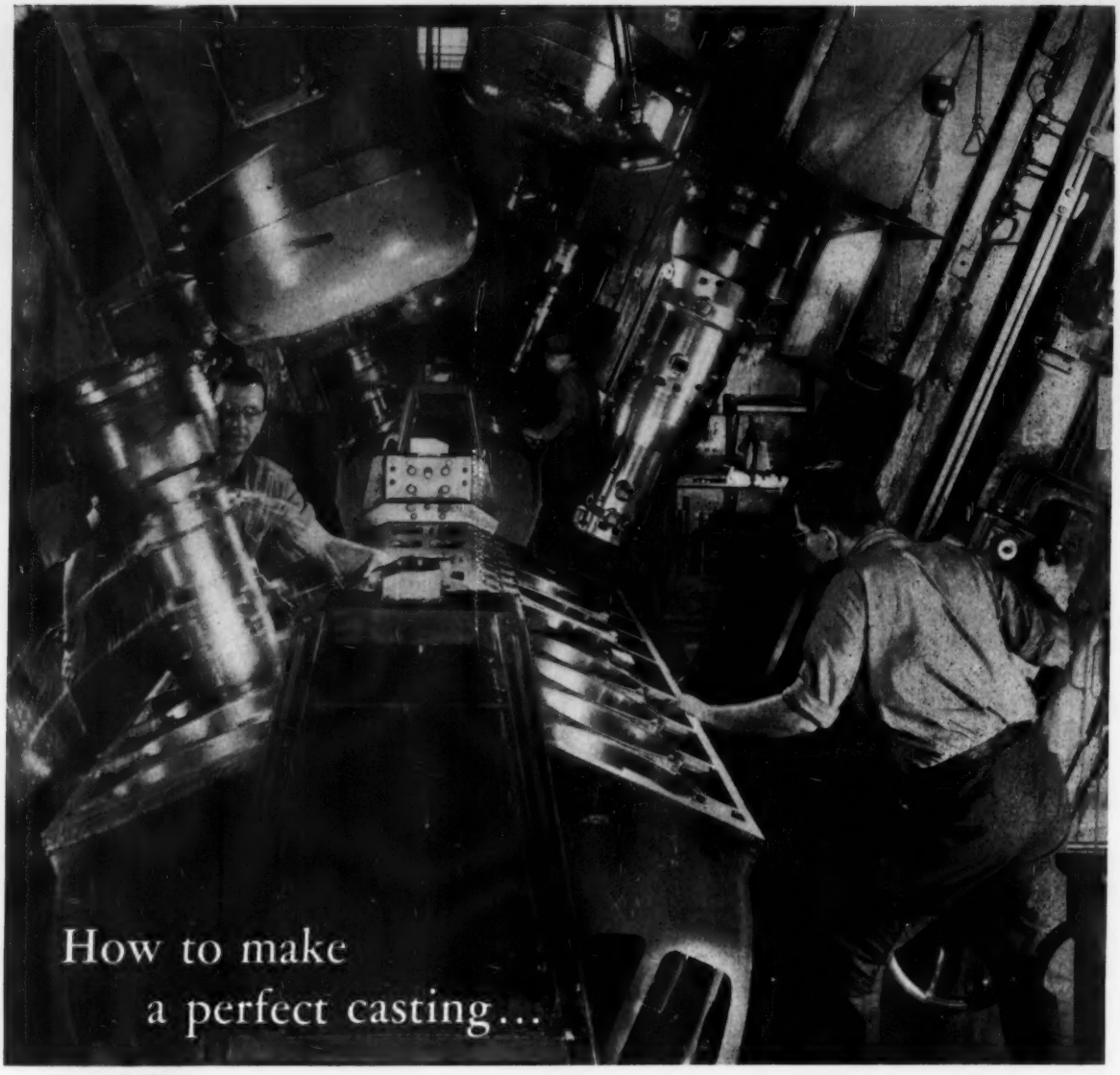
A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.



. . . start with V-5 Foundry Alloy! Vancoram V-5 Foundry Alloy is a special chromium alloy ideally balanced with manganese and silicon. It makes the improvement of gray cast irons easy and economical. Only a small addition improves mechanical properties, density, uniformity. Chill is reduced, too, without the formation of open structure in heavier sections. No chilled corners or edges, either. End results? Dense, tough castings of controlled microstructure which machine superbly! All the facts about this unique, better alloy for irons are contained in our V-5 Foundry Alloy brochure. Write for your copy . . . or call your nearest VCA District Office. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N. Y. • Chicago • Cleveland • Detroit • Pittsburgh

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Circle 713 on Page 53

more costly, but because the cores are lighter, less material is required compared to oil cores.

Permanent mold castings are becoming so complex that frequently mandrels can't be designed to accommodate production. Shell cores provide the answer to this. Aluminum castings using shell cores have introduced problems of knocking the cores out. However, improvements in resins are licking this, and within two years there probably won't be any problem in removing the cores.

Improved Trends on Castings Finish, by Clyde A. Sanders, American Colloid Co., Skokie, Ill. Too many foundrymen change to new processes to improve finish on castings. Better control of existing processes and materials can very well accomplish the results sought. The foundry of the future may have two sand bins, one containing facing sand and the other system sand.

Give the additives to sand a good look. The original sand might be quite satisfactory but after re-use it can be unsatisfactory. Examination may reveal agglomerates, glassy beads, enamels, etc. One inch of good facing sand against the mold face will provide protection against these foreign particles which mar finish of the casting.

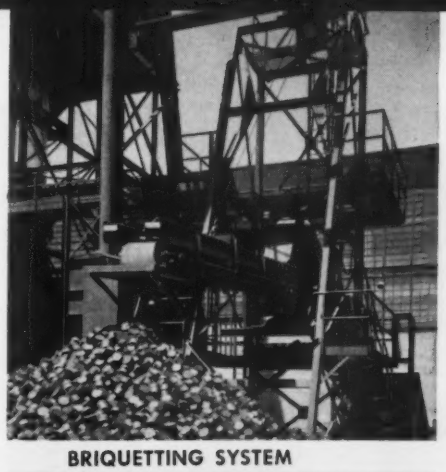
Sand is at its best at room temperature, and it may be satisfactory at 120 degrees, but at 160 degrees it is likely to give problems.

It was brought out in discussion that it is better to vacuum out a mold than to blow it out. Mold edges are not dried out as they are in blowing out.

Making Better Aluminum Castings, by Donald L. LaVelle, Federated Metals Division, American Smelting & Refining Co., South Plainfield, N. J. The prime offenders preventing production of good aluminum castings are inclusions and porosity. Since aluminum oxidizes easily, it should be handled gently to prevent involvement of oxide inclusions in the molten metal. Stirring should be held to the minimum, and then performed slowly without disturbing the bottom layer.

Porosity may result from air entrainment, gas absorbed during melting or from shrinkage due to lack of feeding. In most cases air entrainment can be eliminated by

Circle 714 on Page 53→



BRIQUETTING SYSTEM

AUTOMATIC SHAKEOUT SYSTEM

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FINDS THE ANSWERS

"PV" stands for *Planet Versatility* . . . a quality that has made Planet Corporation known throughout the foundry industry as an organization that has solutions to the most perplexing production, materials handling, or automation problems.

Planet Corporation engineers apply uninhibited thinking to foundry problems to find workable solutions that increase efficiency. No job is too big or too difficult . . . Planet's "VP" engineers have designed complete foundries, automated molding lines, built bulk and unit materials handling systems, developed the world's only true universal transfer device . . . they are experts, in fact, on all types of special handling and automation machinery, and materials handling equipment.

Let Planet demonstrate how its versatile engineering skill, and production and erection know-how can help you. Discuss your problem with a Planet "PV" engineer . . . *it pays to Plan with Planet.*

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• ENGINEERED HANDLING SYSTEMS
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2700 heats

with **Shamva Mullite**

EF roof brick

National Alloy Division, Blaw-Knox Company, combining good melting practice and supervision with the use of "Shamva" electric furnace roof brick, recently set a *2700 heat* roof life record on a 1-ton electric furnace melting heat and corrosion resistant alloy steels.

This represents a plant record. The best previous roof, made of conventional refractory brick, lasted 300 heats.

The selection of refractories on the basis of quality rather than on initial cost has again paid handsome dividends. Many other plants have established new roof service life records using Shamva EF roof brick. Can you afford not to try this specially designed product on your furnaces?

Rating: 1 ton

KVA: 1250

Type steel melted: Stainless

Operated: intermittently

Refractory roof life: 2700 heats

Previous best roof life: 300 heats

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H.K. PORTER COMPANY, INC.

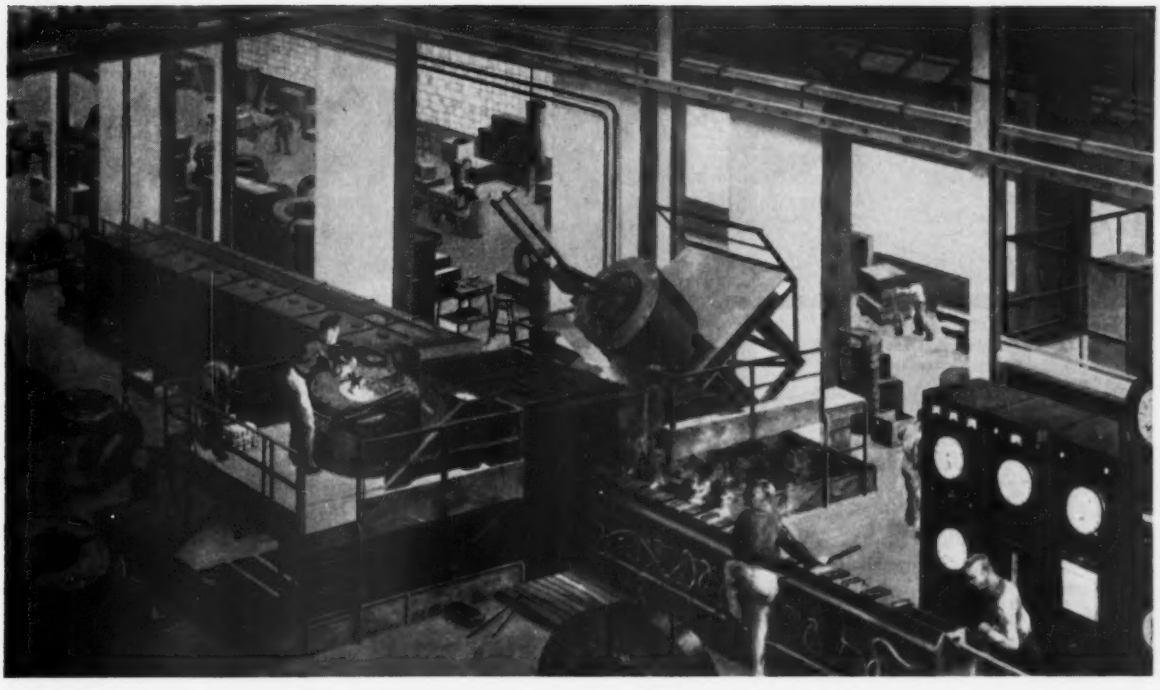
DIVISIONS: Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Mouldings, National Electric, Refractories, Riverside-Alloy Metal, Thermoid, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

holding the crucible or ladle lip close to the sprue opening during pouring. If the sprue is located so that is not possible, a pouring basin extending from the mold edge to the sprue should be used. Gas porosity can be minimized by using dry ingot and remelt, rapid melting, and holding the superheat at the lowest possible point. Remedy for shrinkage is application of suitable gating and risering systems which will provide adequate feeding to the various portions of the castings.

Brass and Bronze Foundry Problems, by Fred L. Riddell, H. Kramer & Co., Chicago. Ability to identify and classify defects in copper-base alloy castings is important in minimizing foundry losses. An example is the misrun. Some possible causes of misruns are: (1) Poor fluidity due to cold metal or impurities in the metal. (2) Interrupted pouring. (3) Improper gating system, covering inadequate sized gates and turbulent flow of metal. (4) Excessive back pressure in the mold cavity, caused by improper sand conditions in the mold and cores, or improper venting of molds so that the flow of liquid metal to all parts of the mold cavity is prevented.

To correct a defect, therefore, all phases of foundry practice must be checked, and the most plausible causes must be corrected. Some of the defects that can be attributed to poor design of gating and risering systems are: Misruns, cold shuts, erosion, turbulence, and shrinkage. A thorough study of each particular casting should be made before any decision on the type and location of gates and risers is made.

"That's a metallurgical symposium I'm leaving for, Miss Snyder, not a 'bull session'"



60 CYCLE INDUCTION MELTING OF HIGH LEADED BRONZES

15 years ago, THE CLEVELAND GRAPHITE BRONZE COMPANY, division of CLEVITE CORPORATION, pioneered 60 CYCLE INDUCTION MELTING of bronzes with up to 35% lead. Special furnaces developed by AJAX for this difficult job are an important element in their unique continuous production line for steel-backed bronze bearing strip. 60 CYCLE INDUCTION MELTING furnaces resulted in substantial improvements and cost savings over gas-fired units used earlier for that purpose. Today, CLEVITE operates six continuous lines in this country and abroad with AJAX 60 CYCLE INDUCTION MELTING furnaces, producing enough strip to make 130 million bearings and bushings per year.

The heavy duty 60 cycle inductor developed by AJAX and pioneered by CLEVITE will attain a lining life of one year with bronzes of substantial lead content. Electromagnetic stirring assures uniform alloy and close temperature control. Compared to externally fired equipment, metal loss savings run into many thousands of dollars per year. Recently, several large producers of leaded bronze castings converted their foundries entirely to 60 CYCLE INDUCTION MELTING.

While this is one of the most difficult metals to handle, the advantages of 60 CYCLE INDUCTION MELTING stand out today wherever copper alloys are melted. As specialists in 60 CYCLE INDUCTION MELTING, we have developed furnace types to best fill each application.

AJAX USA

ENGINEERING CORPORATION

TRENTON 7, NEW JERSEY

60 CYCLE INDUCTION MELTING

Associated Companies: Ajax Electrothermic Corporation Ajax Electric Company

Circle 716 on Page 53

The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Some Remarks on Shell Molding"

● WHEN SAND SICKNESS becomes epidemic, the foundry sand doctor (consultant) receives an urgent call. Arriving at the patient's sand-bedside, he notes temperature, weakened condition, surface discoloration, inability to breathe properly, temperamental behavior, excess moisture, etc. All of these symptoms are duly recognized and considered as he makes his diagnosis.

"What have you been feeding this boy?" the doctor asks.

He then immediately recommends a reversal of diet. He changes the clay, cuts down on the liquids, and calls for more exercise and fresh air (increased mulling and better aeration). The patient revives, recuperates, and finally is restored to complete health.

Six months pass, and again the doctor receives an urgent call—even more urgent than before. He finds that his patient has suffered a relapse; the same old symptoms have reappeared.

"What in the world have you been doing to this sand?" the doctor demands.

The bewildered foundryman shakes his head in despair as he replies, "I don't understand what could have gone wrong. We haven't changed a thing!"

Many years ago—more than my hero would care to admit—an inexperienced salesman of core oils was striving desperately to succeed in his first assignment. He had been sent to one of the larger foundries in his district, a shop that purchased a competitive core oil in considerable quantities. There, he was introduced to the coreroom foreman, a son of the Ould Sod, who was inclined to be somewhat skeptical of the long list of memorized claims which the young salesman recited glibly.

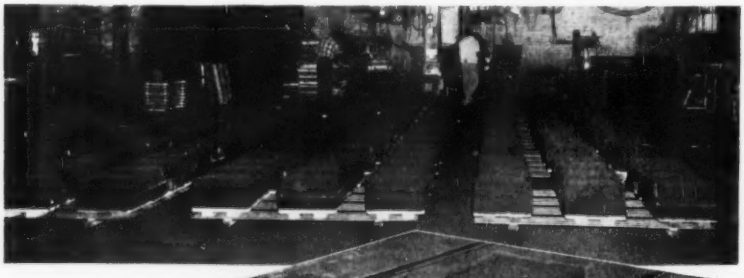
Finally, if only to be rid of the boy, the foreman barked, "All right, sonny, you've made your point. Send me a drum of your wonderful product, and I'll give it a try. On your way out, tell the office to give you an order."

The lad pulled out his pad, made an excitedly hasty memorandum, then started for the office. He had almost reached the door when he was halted by a call from the Irish foreman:

"There's one thing more, sonny. Will this oil of yours stick to a corebox?" At this, the young salesman smiled broadly. "You betcher damn' life it will, mister! Our oil will stick to a corebox better than any other oil on the market!" (Robbie told it much better.)

Years ago, among molders and other foundrymen, there was a common expression which the world at large seemed to accept as a self-evident truth. To wit: "Young man, if you ever hope to amount to anything in the foundry, you've got to have a strong back and a weak mind!"

That expression has lost what-



GET
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with NOMAD RECESSED CONVEYORS!

Nomad Recessed Conveyors give greater flexibility to your operation. The molding area can be used for floor molding or can be quickly changed to a palletized floor depending upon the job. Since the rails are embedded in concrete for stability, the whole area can be worked freely by a front-end loader.

INCREASE PRODUCTIVITY AND SAVE ON MANPOWER —
Molders set molds on wheeled pallets which "roll away" smoothly on rails saving hard physical labor and allowing greater mold production.

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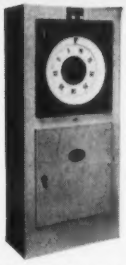
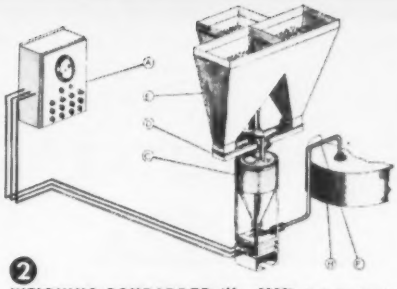
A Complete line of Automatic Production Aids by Dietert-Detroit to reduce operating expenses and improve casting quality.

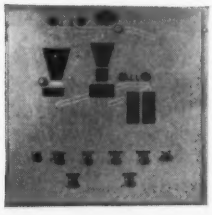


1 **AUTOMATIC MOISTURE CONTROLLER (No. 3907)** Assures accurate, adjustable moisture control during the mixing cycle.

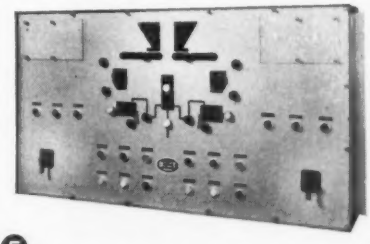


2 **WEIGHING BONDADDER (No. 3899)** Automatically selects and weighs dry additives and delivers them to mixer with low-pressure air.

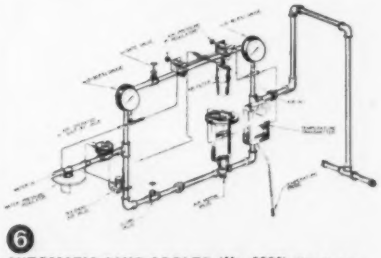
3 **TEMPERED SAND HOPPERTROL (No. 3911)** Automatically controls level of tempered sand in hoppers, bins, etc.



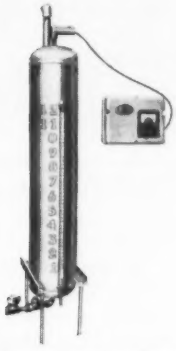
4 **SAND MONITOR (No. 3883)** Automatically coordinates sand mulling and distribution.



5 **AUTOMULL (No. 3884)** Supervises and controls every phase of mixing cycle.



6 **AUTOMATIC SAND COOLER (No. 3903)** Eliminates hot sand problem. Improves mulling efficiency and sand properties. Minimizes moisture evaporation from prepared molding sand.



7 **RAPID WATER AND SLURRY DISPENSER (No. 3906)** Accurately adds pre-set liquid volume to batch type sand mixer in a few seconds.

Dietert-Detroit Automatic Controls are specifically engineered for *your* foundry—and backed by an engineering and service staff trained in all phases of modern automated foundry practice. Dietert-Detroit equipment will permit you to organize for greater speed, efficiency and cleanliness; and put your foundry in a stronger competitive position! May we hear from you?

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Send me complete details on the following:—

1. ☐ Automatic Moisture Controller
2. ☐ Weighing Bondadder
3. ☐ Tempered Sand Hoppertrol
4. ☐ Sand Monitor
5. ☐ Automull
6. ☐ Automatic Sand Cooler
7. ☐ Rapid Water and Slurry Dispenser

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DIETERT DETROIT

HARRY W. DIETERT CO.
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ever sense or humor it might once have contained. Today, every intelligent person in the world knows that, except for purposes of exhibition or physical well-being, a strong back is a dubious asset. The strong mind has been responsible for every major human achievement. A great deal of the world's wealth today is earmarked for the development of such minds.

But just what do we mean by "strong minds"? Are we thinking of Edisons, Einsteins, Churchills, or Shakespeares? Not at all. These meteoric personalities serve to demonstrate the higher limits in human achievement and to encourage rather than discourage a lower level of valuable performance.

Ben Hecht, the writer, in certain quarters was termed a genius. He modestly accepted the designation—calmly admitted that he is a genius. Then, as an afterthought, he ventured the opinion that every man is a genius, in some degree; and at various points in his 600-page autobiography, Hecht supplied material to support his contention.

Abraham Lincoln is reported to have said, "Genius consists of 10 per cent inspiration and 90 per cent perspiration." Under that definition, many men could qualify. Perhaps Ben was right.

In our every-day contact with friends and co-workers, we seldom associate the idea of genius with either our own activity or theirs. Yet if we were permitted to examine (microscopically) the inner workings of one of the least of our fellows, and determine just what makes him tick, we might learn to our amazement of a potentiality that too often passes unsuspected.

The foundry may not be an ideal breeding ground for genius, but it has contributed its full share of these leading lights to industry. Any man with an ounce of intelligent appreciation couldn't spend a year in a foundry without observing workmen of exceptional talent and performance. Genius may be too extravagant a term to describe the qualifications I have in mind, but I know of no other word which fitly conveys the general idea.

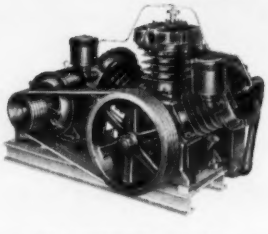
The men who conceived and designed the centrifugal casting machine, the shell process, sandslingers, automatic molding units, and innumerable other foundry devices of merit all are unsung heroes. They rate the title of genius in my book. And the fellows who substituted woodflour and spray binder for horse manure and molasses water also are deserving of honorable mention.

Genius often is a hidden quality and quantity. It frequently passes for mediocrity, even to itself. Dennis Hanks, when he gazed for the first time on his newborn cousin, Abraham Lincoln, exclaimed, "Shucks, he'll never amount to much!" History has disagreed with that verdict.

Modern developments like the automobile, the wristwatch, or even carbon paper are not the product of one man's mind. They are the result of progressive education, cumulative thought, and patient experiment. Edison tried 2500 different materials before he produced a salable incandescent lamp, and other

Where the going is TOUGHEST the Curtis keeps going!

Sandiest FOUNDRY conditions haven't stopped this CURTIS AIR COMPRESSOR



The CURTIS C-100 two-stage air-cooled air compressor. 25-30-40 H.P.

- CURTIS-SEAL CRANKCASE
- TIMKEN MAIN BEARINGS
- SELF CENTRO-RING OILING
- AIR COOLED: NO COOL WATER REQUIRED
- PRECISION BUILT

For compressed air—industry depends on *Curtis*. Eliminate production line delays. Get more air faster . . . at lower cost. Where the going is toughest (foundry, factory or shipyard) put the CURTIS C-100 to work and forget it!—Full line of industrial compressors for ordinary and special applications.

For complete information write for illustrated folder.

OUR 105th YEAR

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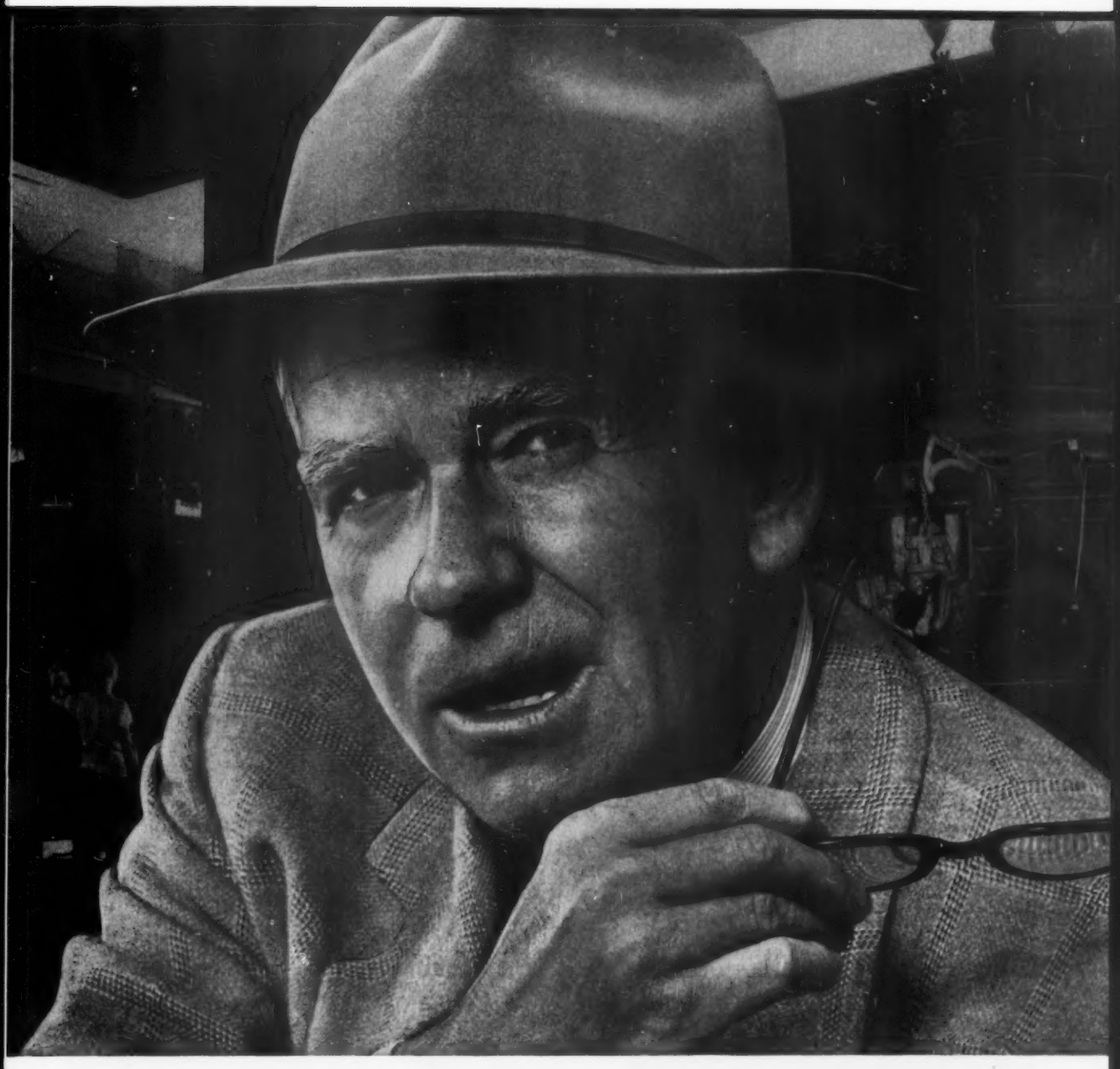


"We use only one chrome—refined chrome"

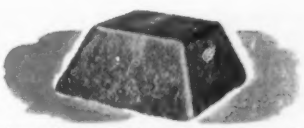
Iron and steel foundry operators are cutting chromium costs by using ELECTROMET's new low-cost refined chrome for all high-carbon chromium additions. Inventory, handling, and storage are greatly simplified by stocking only this one high-carbon chromium alloy. It is ideal for use as:

- **A charge material for basic-melted stainless steel.**
- **Final additions for alloy steel castings.**
- **Cupola or ladle additions for cast iron.**

Refined chrome combines the economy of regular charge chrome with the maximum cleanliness and low residual element content of conventional high-carbon ferrochrome.

For facts on how refined chrome can reduce your costs, contact your Union Carbide Metals representative.

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.



Convenient 20- and 40- pound pigs of refined chrome are magnetic, allowing easy handling with an electromagnet. Crushed sizes are available for ladle additions.

UNION CARBIDE METALS

Electromet *Brand Ferroalloys and other Metallurgical Products*

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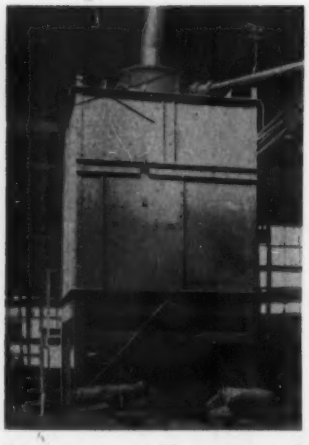

We have a portable experimental pneumatic unit available for trial use in any plant that requests it. Air requirements are generally low; existing compressed air supply can be used.

THE BRADY CONVEYORS CORP.

4244 Dempster Street
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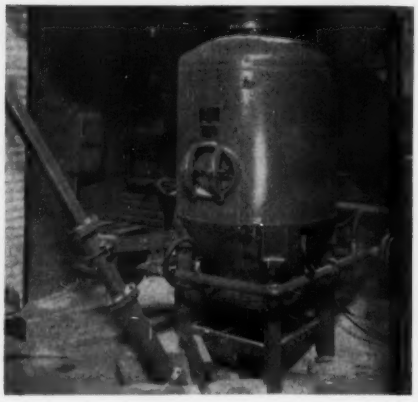
Here's how the BRADY FLO-VEYOR can move sand quickly and cheaply to all parts of your foundry.

Sand and compressed air are mixed in a pressure vessel. This mixture of air and solids moves through the pipe line just as fluid would flow under pressure. The initial cost is only a fraction of that of mechanical systems for long distance conveying. Maintenance, of course, is kept at a minimum.



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AIRETOOL GRINDERS SAVE PRODUCTION TIME

Airetool pneumatic grinders cut production costs because they speed up big metal removal jobs. They're powered by high torque air motors that won't slow down or stall in constant use . . . no matter how tough the job is. Yet they are easily handled and maneuvered. Operators get more work done without extra effort. Two horizontal models, 8″ and 6″ wheels; two vertical models, 6″ wheel and 7, 8 and 9″ disc wheel. Write for Catalog 67. Airetool Manufacturing Co., Springfield, Ohio.

REPRESENTATIVES in principal cities of U.S.A., Canada, Mexico, South America, England, Puerto Rico, Italy, Japan, Hawaii.
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AIRETOOL MANUFACTURING COMPANY SPRINGFIELD, OHIO

Circle 721 on Page 53

companies have been improving on it ever since. How many sand additives have you tried in your search for the ideal stabilizer?

The emotional misuse of a word during a time of national stress can cause it to be corrupted to a point of no return to its original meaning. Many words have undergone this metamorphosis in meaning until their original identity has been lost to the layman. For instance, you might look up sincere, nice, ilk, aristocrat, and vulgar. Finally, consult Webster to see the history of "radical."

When the word is raised in conversation, we invariably visualize a hollow-eyed individual with a torch in one hand, and a red flag in the other. Yet this word never was intended to apply solely to political activity. The men who first concocted synthetic molding sand or conceived of shell molding, sand-slinging, or centrifugal casting were radicals who have earned our gratitude.

When John Penton decided to abandon his original vocation of molder and become the pioneering editor of FOUNDRY, his friends probably questioned his sanity. He too was taking a radical step, and we honor his memory. We might also remember that the Boston Tea Party hardly could be considered a conservative gesture, yet most Americans point to it with pride.

"Uneasy lies the head that wears the crown!"

A foundry superintendent surely is a man of importance, substance, and considerable responsibility. When an unusual amount of trouble occurs, as it frequently does, he is expected to analyze the tragedy and immediately to expound a remedy. Foreman, melter, molder, and sandmixer may express their individual opinions, but they all look to the superintendent for a mandatory decision.

Byron McDonald, of Pacific Graphite Co., Oakland, Calif., says that a foundry superintendent must possess all the qualities of a top sergeant in the army. He must be stern, even ruthless, and his orders, good or bad, must be obeyed! He rarely is praised and frequently is

The terms "Electrolier" and "Union Carbide" are registered trade marks.

Circle 720 on Page 53

ENGINEERED INSTALLATION BY MID-WEST MEANS EXTRA BENEFITS AT NO EXTRA COST

It takes the correct abrasive, properly installed, to meet the production requirements of both time and quality. The product sales engineers of Mid-West will help you choose the right abrasive to meet *your* particular requirements, in *your* own plant, on *your* job . . . whether it be old applications, new set-ups or quality control. These highly trained abrasive specialists are backed by the constant research and testing of the Mid-West Abrasive Company in their efforts to meet and exceed the demands of the ever-changing industrial scene. Your call will bring you one of these skilled men without obligation.

Mid-West is one of only three abrasive companies offering customers a complete line of abrasive products: sandpaper, grinding wheels, honing stones, abrasive grain and grinding machines.

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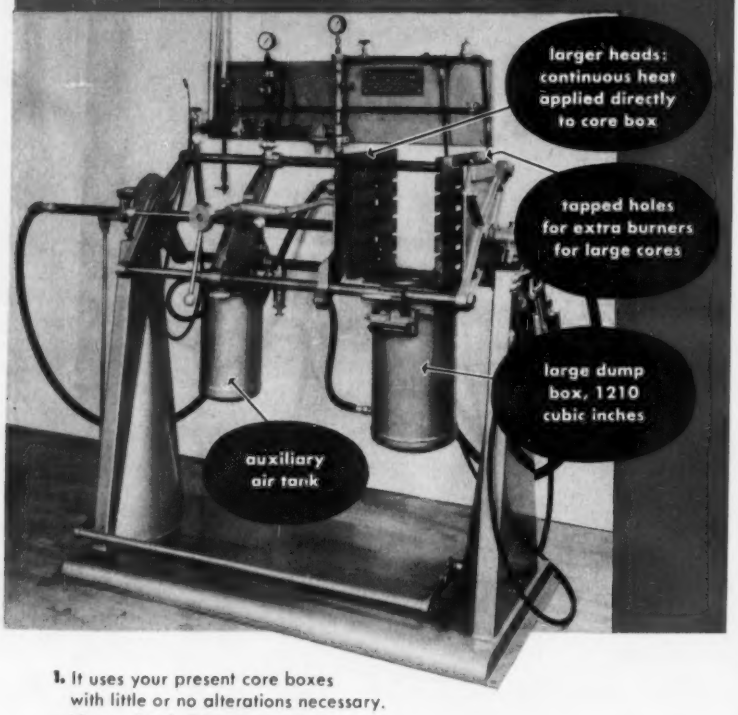
Announcing the New "200 SERIES"

'DEPENDABLE'

SHELL CORE MACHINE


larger heads: continuous heat applied directly to core box
tapped holes for extra burners for large cores
large dump box, 1210 cubic inches
auxiliary air tank

1. It uses your present core boxes with little or no alterations necessary. No need to build new core boxes.
2. Continuous heat applied directly to back of core box. Thin sections most desirable. Fast and efficient.
3. Operates on any type of gas, natural, manufactured, mixed or bottled. Economical.
4. Quick change for short runs. Clamps provided.
5. Produces intricate small cores in four gang boxes at the rate of ten per minute, and cores up to 14" diameters or 30" lengths at the rate of one per minute.
6. Various thicknesses of core can be obtained by length of time invested.
7. Eliminates the need for driers or pasting.
8. Shell cores produced offer Unexcelled Permeability . . . Collapsibility . . . Accuracy . . . Easy Shake-Out.
9. Low initial cost . . . $1770, F.O.B. Portland, Oregon.
10. Your Dependable Shell Core Machine comes completely equipped with accessories and assembled ready to operate. Just hook up to gas and compressed air lines. Shipping weight, crated, 500 lbs.

Manufactured by

DEPENDABLE Pattern Works

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DEALERS:

Frederic B. Stevens, Inc. *Detroit 16, Michigan*
Pennsylvania Foundry Sup. & Sand Co. *Philadelphia 24, Penn.*
Snyder Foundry Supply Co. *Los Angeles 58, Calif.*
Kramer Industrial Sup. *Denver 5, Colorado*
Sinclair-Brandt Co. *Houston 21, Texas*
Pacific Graphite Co., Inc. *Oakland 8, California*
Harold E. Pridmore *Los Altos, Calif.*
Don Barnes, Ltd. *Hamilton, Ont., Canada*
The Foundry Supply Co. *Minneapolis 14, Minn.*
Frank H. Jefferson, Inc. *Seattle 4, Wash.*
Sierra Foundry Supply Co. *San Gabriel, California*
Shallway International Corp. *Los Angeles, Calif., and Crawley, England*
W. O. McMahon *Birmingham 9, Ala.*
La Grand Industrial Sup. *Portland, Oregon*
St. Louis Coke & Foundry Sup. *St. Louis, Missouri*
Canfield Foundry & Eqpt. Co. *Kansas City, Kansas*
Smith-Sharpe Co. *Minneapolis 14, Minnesota*

condemned, from both above and below; but his performance is as essential as that of the melting furnace.

I have never met an infallible superintendent, yet infallibility seems to be expected of him. He is assumed to have mastered all the technical phases of his complicated craft, from the drawing board to the cleaning room. If his nights are sleepless, and he turns to strong drink for respite; if his occasional senseless display of anger wounds a conscientious and innocent subordinate or co-worker, who among you would throw the first stone at him?

Of all the positions in this casting business that I would never care to occupy, that of foundry superintendent tops the list!

Publishes New Gray Iron Designer's Digest

As an engineering aid in the design of castings, the Gray Iron Founders' Society has announced publication of "Designer's Digest," which will appear every other month.

Brief and concise articles suggesting methods of designing better gray iron castings and improving products will be contained in the digest. It will also include helpful technical information.

Introductory copies have been issued by the society to a mailing list of over 6000, as a result of surveys, ad inquiries, design contests and clinics. Copies will be sent upon request to Gray Iron Founders' Society Inc., National City-East Sixth Bldg., Cleveland 14.

Plan Sixth Material Handling Course at Lake Placid, N. Y.

Equipment selection and application, handling and operating problems, system design, and other subjects will be covered at the sixth annual Material Handling Training Course, June 14-27, at the Lake Placid Club, Lake Placid, N. Y. A limit of 56 persons will be enrolled.

H. C. Keller, J. Walter Snavely, and Jervis C. Webb will be among the 20 instructors. For details write James R. Bright, director, Industrial Management Center, 56 Robbins Rd., Lexington, Mass.

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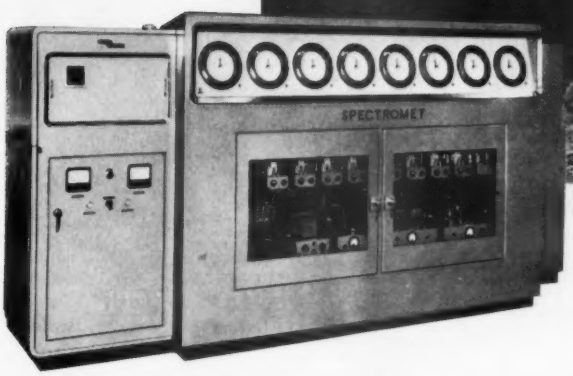
ferrous

& non ferrous



SAVINGS

in the melt shop by quick analysis with the

NEW SPECTROMET®

CHEMICAL COMPOSITION IN MINUTES
NO LABORATORY REQUIRED

The Baird-Atomic SPECTROMET allows high precision analysis of alloying and minor elements to be made quickly and easily. Results are reported to the melt shop in minutes permitting corrections to be made prior to pouring. The expanded SPECTROMET is specially designed for rugged, practical use . . . to be operated by non-technical personnel.

SAVE MONEY, SAVE TIME, ELIMINATE WASTE

- Eliminate "off analysis" heats.
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- Conserve expensive alloying elements by confidently aiming at low side of the specification. Detect harmful tramp elements.
- Install close to the melt shop without need for special laboratory.
- Reduce expenses by saving manpower, supplies, and space.

Only the SPECTROMET offers all these features:

- Results presented on indicator dials directly in percent concentration.
- The *Automatic Optical Servo Monitor* to provide continuous compensation for variation in temperature and atmospheric pressure, vibration and shock.
- Parallel interchangeable read-out channels to increase reliability, facilitate maintenance.
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Circle 724 on Page 53

Literature for Foundrymen

Phenolic Resins

Booklet CDC-358 gives features, properties, and technical data on complete line of phenolic resins, varnishes, and molding powders. A section is devoted to foundry resins. — **Chemical Materials Dept., General Electric Co.,** One Plastics Ave., Pittsfield, Mass.

For More Details Circle No. 401—Page 53

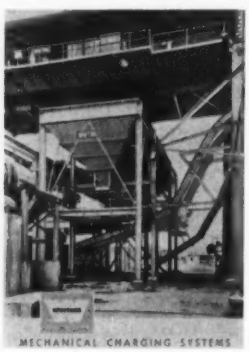
Laboratory Ovens

Bulletin 5720 describes mechanical convection ovens for operation to 800° F, a muffle furnace for temperatures to 1850° F, and an electric resistance rod furnace for temperatures to 2700° F.—**Soiltest Inc.,** 4711 W. North Ave., Chicago 39, Ill.

For More Details Circle No. 402—Page 53

Cupola Chargers

Bulletin FY-179 gives selection data and an item by item rundown on cupola charging equipment. Several product and application pho-



MECHANICAL CHARGING SYSTEMS

tographs plus explanatory drawings and typical installation diagrams are included to aid selection of proper equipment for a particular job.—**Whiting Corp.,** 15607 Lathrop Ave., Harvey, Ill.

For More Details Circle No. 403—Page 53

Machining Aluminum

Handbook gives data on tool angles and designs, tool materials, and machining practices for aluminum. Proper speeds, feeds, lubricants, and cutting compounds are explained as are filing, sawing, and grinding. Write on company letterhead to **Reynolds Metals Co.,** Dept. PRD-3, Box 2346, Richmond 18, Va.

For More Details Circle No. 404—Page 53

Air Motors

Air motors covering a range from 0.3 to 24 hp and speeds from 50 to 2580 rpm at rated horsepower are presented in Form 5072A. Multivane and piston motors are listed with specifications and dimension drawings. — **Ingersoll-Rand,** 11 Broadway, New York 4, N. Y.

For More Details Circle No. 405—Page 53

Solenoid Control Valves

Pilot-operated single and double solenoid control valves in two and three-position designs; two-way, three-way, and four-way; including neutral, compound-on and compound-exhaust actions are detailed in Bulletin 582-A.—**Hunt Valve Co.,** Salem, Ohio.

For More Details Circle No. 406—Page 53

Air Scrubber

Bulletin HP-955-A covering a hydro-precipitator scrubber describes the scrubbing action in trapping noncondensable and normal dust below five microns in size.—**Johnson-March Corp.,** 1724 Chestnut St., Philadelphia 3, Pa.

For More Details Circle No. 407—Page 53

Transverse Tester

Brochure shows the company's transverse testing machine full size and describes its features and operation. — **Pasadena Hydraulics Inc.,** 1433 Lidcombe, El Monte, Calif.

For More Details Circle No. 408—Page 53

Slider Belt Conveyors

Bulletin 175-B provides construction, installation, and operational details on slider-board belt conveyors.—**Sprout, Waldron & Co.,** 130 Logan St., Muncy, Pa.

For More Details Circle No. 409—Page 53

Batteries

Photos, sketches, and text in Form 6230 detail the design and construction features of industrial batteries which can be used interchangeably in more than one size truck.—**Exide Industrial Div., Electric Storage Battery Co.,** Rising Sun & Adams Avenues, Philadelphia 20, Pa.

For More Details Circle No. 410—Page 53

Fork Truck

Complete fork and tractor capacities and specifications for a fork lift truck which can raise 4000 lb to 22½ ft or 6000 to 12 ft at 24-in.

load centers are given in Bulletin KM-615. The lift mechanism is removable, permitting other material handling devices illustrated in the bulletin to be mounted on the basic chassis.—**Kwik-Mix Co.,** Port Washington, Wis.

For More Details Circle No. 411—Page 53

Pneumatic Grinders

Portable pneumatic grinders in several sizes are described in Catalog PT-58. Grinding wheels, wire brushes, air line controls, and accessories also are discussed.—**Thomas C. Wilson Inc.,** 21-11 44th Ave., Long Island City 1, N. Y.

For More Details Circle No. 412—Page 53

Automatic Air Filter

Bulletin 248-C gives construction and operating characteristics of an automatic air filter which uses roll-type, renewable media.—**American Air Filter Co.,** 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 413—Page 53

Tumbling Barrel

Auxiliary tumbling barrels for use in wet blast equipment are covered in Bulletin 452-D. Mechanical and

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are you *Satisfied* with your blast cleaning operation?

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Circle 725 on Page 53

operating specifications and operating instructions are included.—**Techline Div., Wheelabrator Corp.**, 1102 Avenue V, Vicksburg, Mich.

For More Details Circle No. 414—Page 53

Magnetic Starters

Booklet EN-150 covers magnetic starters in NEMA sizes 0 through 4 for reversing and nonreversing single phase and squirrel cage motors.—**Cutler-Hammer Inc.**, 244 N. 12th St., Milwaukee 1, Wis.

For More Details Circle No. 415—Page 53

Motor Applications

Motor application guide, Form 270 A, describes the company's motors and covers motor applications. Selection charts provide motor selection data.—**Century Electric Co.**, 18th & Pine Sts., St. Louis 3, Mo.

For More Details Circle No. 416—Page 53

Vibration Control

Vibration control mountings and materials covered in Bulletin IND-11 include five types: Positive isolation, negative isolation, steel spring mountings, rubber-in-shear mountings, and pad mountings. —**Vibration Mountings Inc.**, 98-15 50th Ave., Corona, L. I., N. Y.

For More Details Circle No. 417—Page 53

Speed Reducers

Complete data on universal worm gear speed reducers designed to operate in three different positions are given in Folder 2724. Tables list service factors, load classes, input horsepower ratings, overhung load ratings, and thrust load ratings. —**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 418—Page 53

Leak Detection

Bulletins 1A and 1B describe the properties of nitrous oxide and gas service equipment for use with infrared rays to detect microscopic leaks in parts such as castings.—**Ohio Chemical & Surgical Equipment Co.**, a division of **Air Reduction Co.**, Madison 10, Wis.

For More Details Circle No. 419—Page 53

Fans and Ventilators

Catalog gives capacity and other specifications on the company's numerous sizes of fans and exhaust equipment.—**Harvey P. Bertram Co.**, 2225 Bogen St., Cincinnati 22, Ohio.

For More Details Circle No. 420—Page 53

Truck Attachments

Folder illustrates and describes 30 different attachments for powered industrial trucks. — **Elwell-Parker Electric Co.**, 4205 St. Clair Ave., Cleveland 3, Ohio.

For More Details Circle No. 421—Page 53

Air and Hydraulic Cylinders

Folder contains a file of bulletins, specification sheets, and price lists for the company's line of air and hydraulic cylinders.—**Sheffer Corp.**, Cincinnati 15, Ohio.

For More Details Circle No. 422—Page 53

V-belt Drives

Bulletin A-695 describes compact, inexpensive V-belt drives for handling up to 1500 hp.—**Dodge Mfg. Corp.**, Mishawaka, Ind.

For More Details Circle No. 423—Page 53

Gas Combustion Equipment

Condensed Catalog ID-292-A covers industrial gas combustion equipment, including air-gas mixers, burners, pilot and ignition devices,

ISOLATION BOOTH

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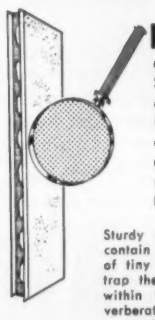

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Circle 726 on Page 53

Circle 727 on Page 53→

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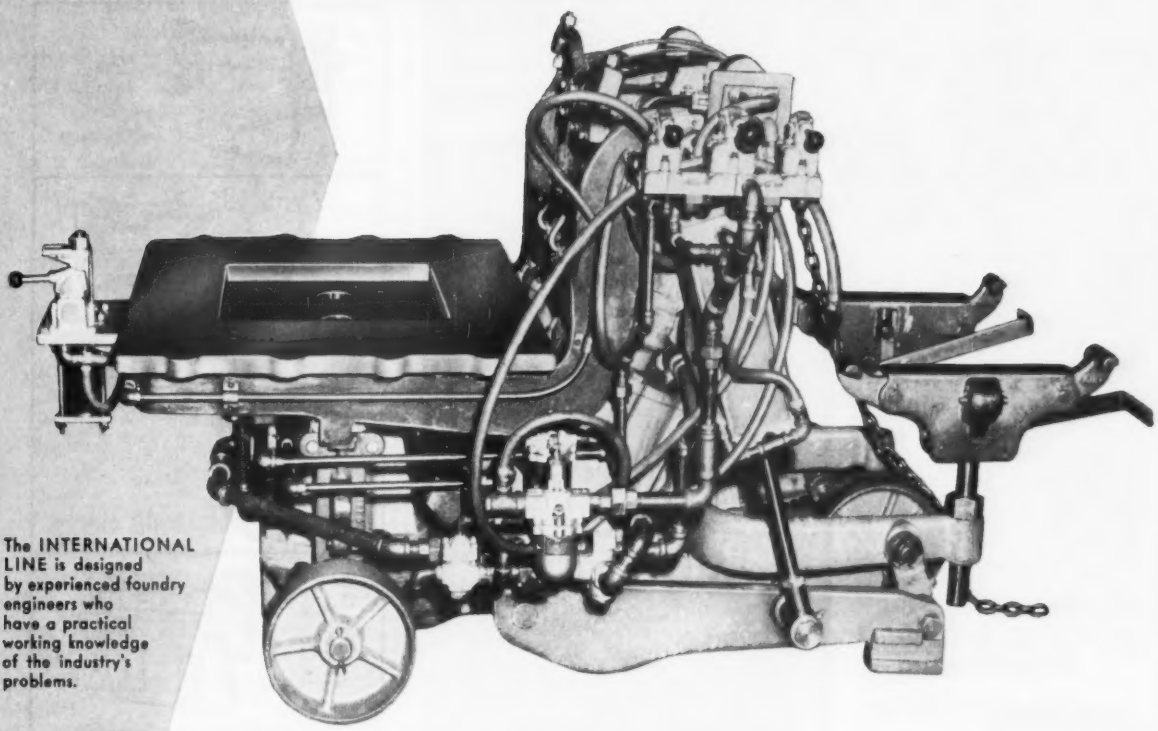

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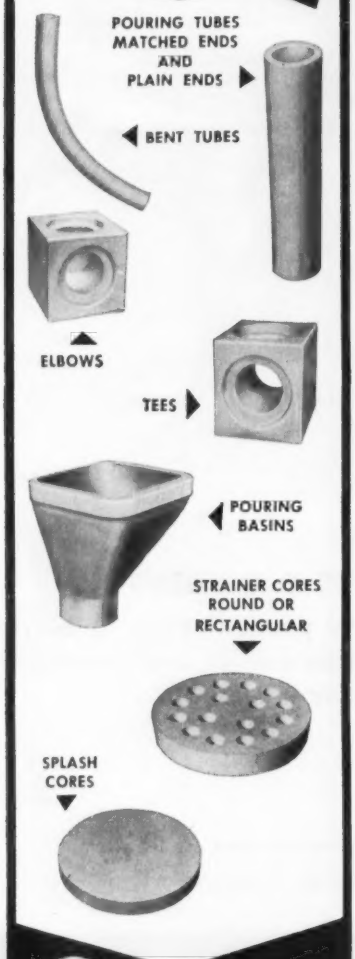

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Circle 728 on Page 53

controls, valves, regulators, and accessories.—**Byrant Industrial Products Corp.**, 17700 Miles Ave., Cleveland 28, Ohio.

For More Details Circle No. 424—Page 53

Grinding Equipment

Catalog 59 covers pedestal, snagging, disc, lathe, and carbide tool grinders; buffing and polishing lathes; dust collectors; abrasive cutoff machines; speed lathes, and special machinery for grinding, polishing, milling, drilling, and boring.—**Cincinnati Electrical Tool Co.**, 369 Mt. Hope Ave., Cincinnati 4, Ohio.

For More Details Circle No. 425—Page 53

Electric Hand Tool

Electrically-powered hand tool, mounted wheels, saws, brushes, cutters, drum sanders, and bands are described and illustrated in Bulletin 6065.—**Chicago Wheel & Mfg. Co.**, 1101 W. Monroe St., Chicago 7, Ill.

For More Details Circle No. 426—Page 53

Air Dryers, Cleaners

Textual data, tables, charts, and drawings in Catalog D3-1058NE5 give detailed information on compressed air dryers and cleaners with capacities up to 3000 cfm.—**Van Products Co.**, 5738 Swanville Rd., Erie, Pa.

For More Details Circle No. 427—Page 53

Adjustable-speed Drives

Operation and application of wide-range, adjustable-diameter, wedge-belt sheaves are discussed in Catalog WRB-58.—**American Pulley Co.**, 4200 Wissahickon Ave., Philadelphia 29, Pa.

For More Details Circle No. 428—Page 53

Blowers and Exhausters

Specifications, operational data, and technical information on centrifugal blowers and exhausters are given in Bulletin B-7.—**Billmyre Blower Div., Lamson Corp.**, Syracuse 1, N. Y.

For More Details Circle No. 429—Page 53

Addition Alloys

Three leaflets are offered. One, covering silicon alloys, lists 13 grades of ferrosilicon with silicon contents from 22 to 95 per cent. The second, on manganese alloys, gives compositions and uses of fer-

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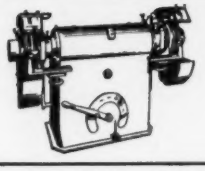
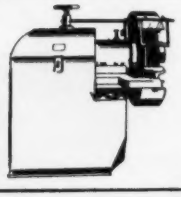
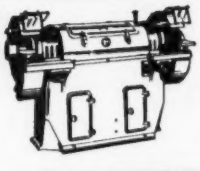

Gear Drive

Vari-Speed Single or Dual


Direct Drive

Belt Drive


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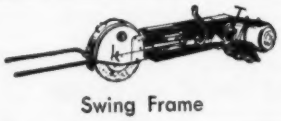
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Circle 729 on Page 53

romanganese briquets and silicomanganese alloys and briquets. The third, on chromium alloys, details 13 ferrochromium alloys, four ferrochrome-silicon alloys, and ferrochromium briquets. — **Vanadium Corp. of America**, 420 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 430—Page 53

Aluminum Products

Booklet, "Aluminum Mill Products," includes a section on casting alloys. Analyses, properties, and characteristics are given for sand, permanent mold, and diecasting alloys. — **Kaiser Aluminum & Chemical Sales Inc.**, Dept. NR-19, 919 North Michigan Ave., Chicago 11, Ill.

For More Details Circle No. 431—Page 53

Electric Hoists

Bulletin 158-G describes a line of electric hoists available in capacities from $\frac{1}{8}$ to 2 tons with a wide range of lifting speeds.—**Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.**, Fremont Ave., Tonawanda, N. Y.

For More Details Circle No. 432—Page 53

Portable Air Tools

Bulletin 1020A on pneumatic drills, nut setters, and screw drivers, also pictures the company's grinders, sand rammers, chipping hammers, and scaling hammers.—**Master Pneumatic Tool Co.**, Bedford, Ohio.

For More Details Circle No. 433—Page 53

Chaplets

Laminated plastic chart shows chaplets and provides data covering factors to consider in selecting the proper type chaplets for specific applications. — **Fanner Mfg. Co.**, Brookside Park, Cleveland 9, Ohio.

For More Details Circle No. 434—Page 53

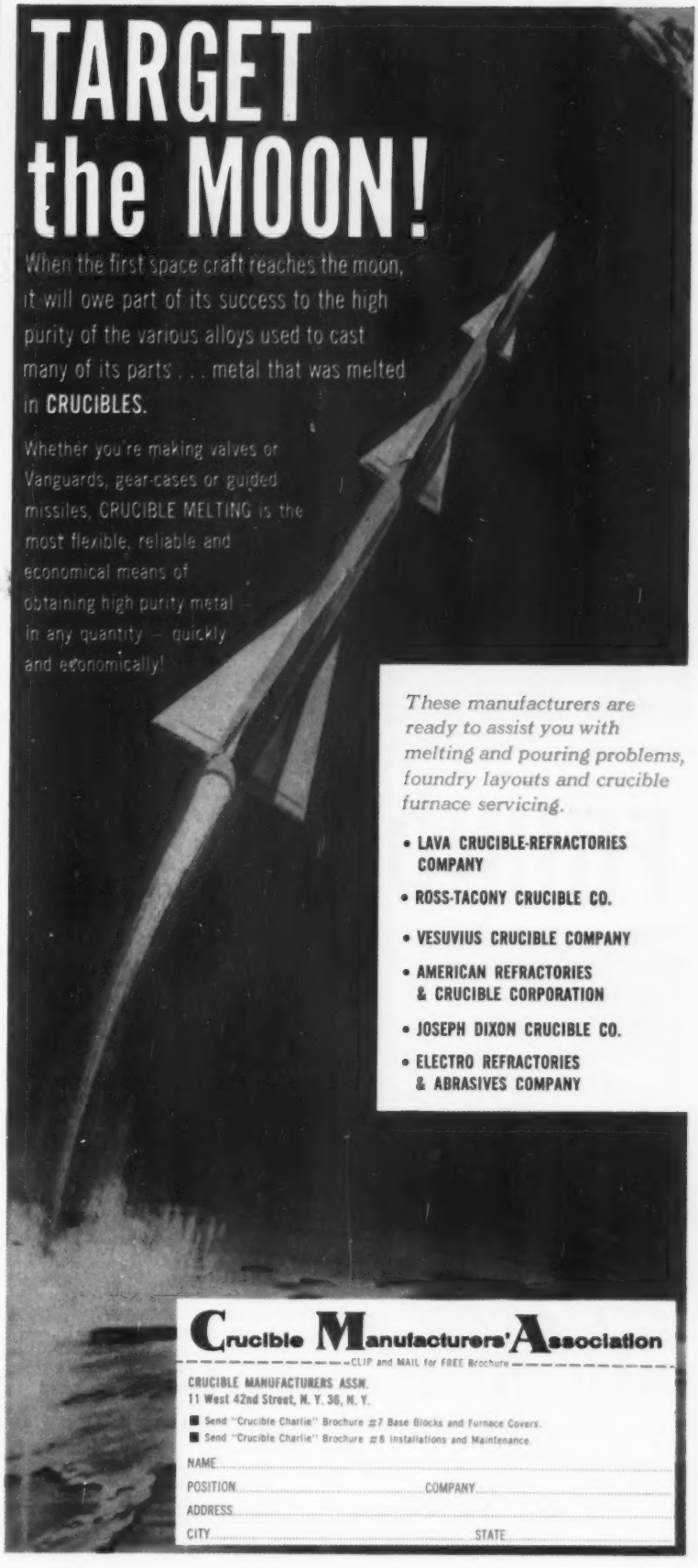
Hose Accessories

Condensed Catalog 34 contains information on couplings and fittings for every type of industrial rubber hose.—**Hose Accessories Co.**, 2704 N. 17th St., Philadelphia 32, Pa.

For More Details Circle No. 435—Page 53

Barrel Finishing Machines

Brochure B-25-C contains design features and specifications for 14 standard units, two small barrel models, and 11 specialized barrel finishing machines. The firm's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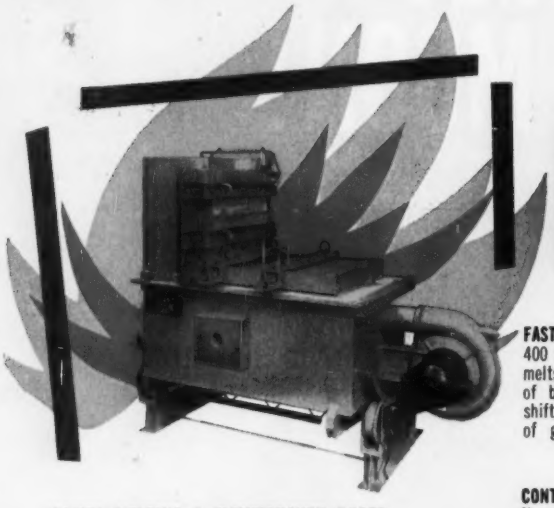

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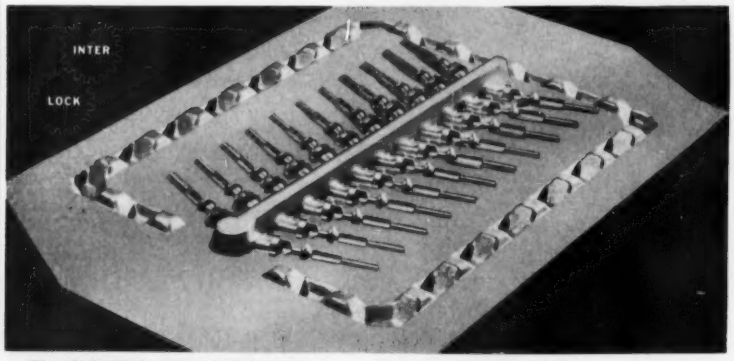

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complete line of barrel finishing compounds and media also is described.—**Almco, Queen Products Div., King-Seeley Corp.,** Albert Lea, Minn.

For More Details Circle No. 436—Page 53

Laboratory Glassware

Catalog and price list presents technical and physical data on laboratory glassware including beakers, crucibles, dishes, flasks, tubing, graded seals, and ground joints.—**Burrell Corp.,** 2223 Fifth Ave., Pittsburgh 19, Pa.

For More Details Circle No. 437—Page 53

Motor Selection

Bulletin B-2103-4 provides selection data for users of alternating current motors from one through 200 hp.—**Reliance Electric & Engineering Co.,** 24701 Euclid Ave., Cleveland 17, Ohio.

For More Details Circle No. 438—Page 53

Conveyor Idlers

Brochure describes features and gives dimensional data on conveyor belt idlers. Conveyor belt installations are illustrated.—**Jervis B. Webb Co.,** 8955 Alpine Ave., Detroit 4, Mich.

For More Details Circle No. 439—Page 53

Air Hoists

Specifications, operating data, and accessory data on air hoists in 1000 to 2000-lb capacities are given in brochure.—**Yale & Towne Mfg. Co.,** 11000 Roosevelt Blvd., Philadelphia 15, Pa.

For More Details Circle No. 440—Page 53

Gravity Roller Conveyors

Handbook presents design features, engineering data, specifications, and accessories for gravity roller, wheel, and portable conveyors.—**Lamson Corp.,** Syracuse 1, N. Y.

For More Details Circle No. 441—Page 53

Fluid Cylinders

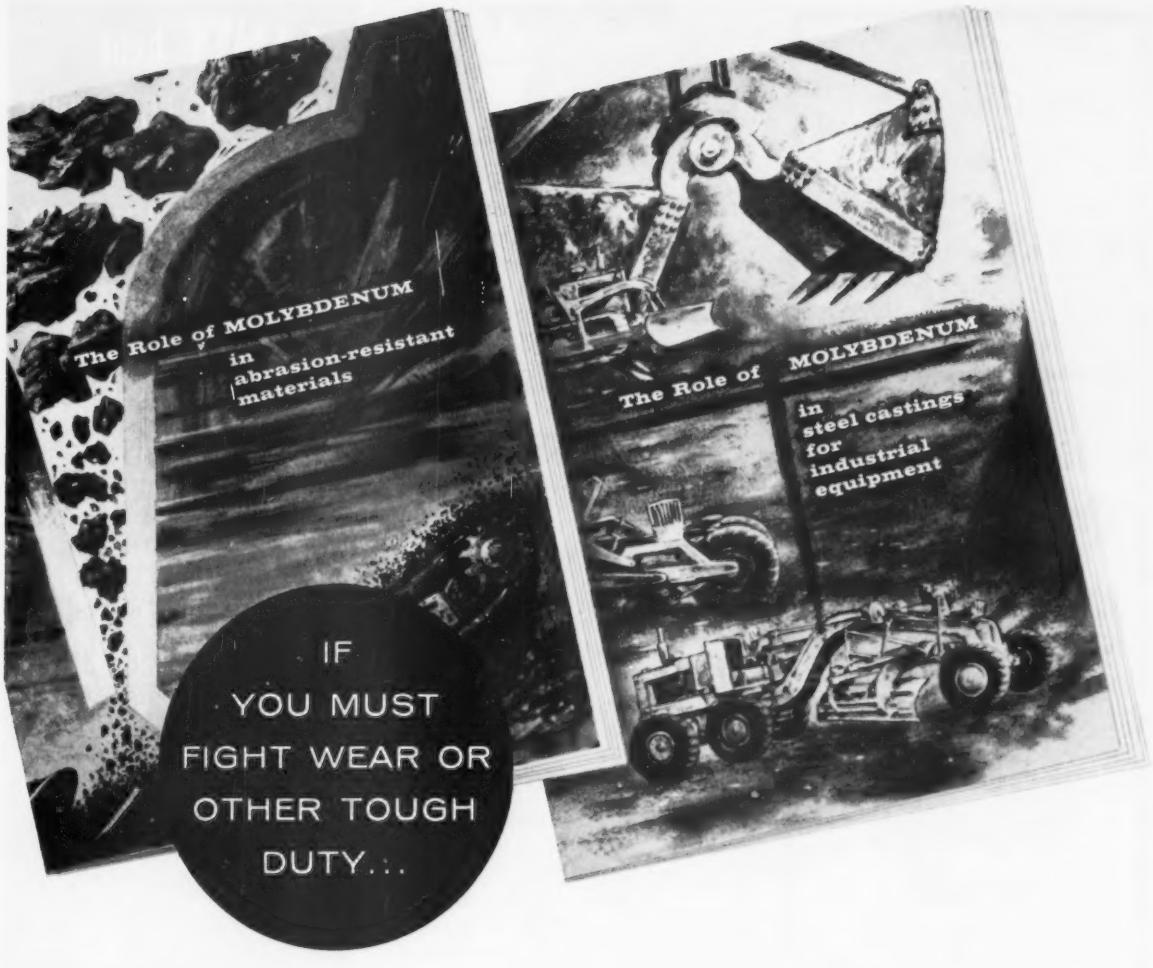
Bulletin SQ 10-58 provides technical data on square head cylinders for use with air or oil as the working medium.—**Tomkins-Johnson Co.,** Jackson, Mich.

For More Details Circle No. 442—Page 53

Hinged Pan Conveyors

Bulletin 58-1 describes use of hinged pan conveyors in foundries and other plants.—**Anchor Steel & Conveyor Co.,** 6906 Kingsley Ave., Dearborn, Mich.

For More Details Circle No. 443—Page 53



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Circle 733 on Page 53

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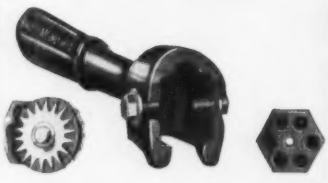

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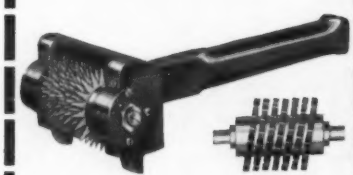

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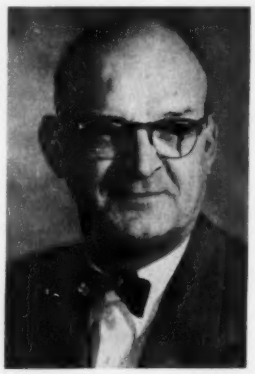
Obituary

NORMAN F. HINDLE, head, Mechanical Engineering Department, University of Idaho, Moscow, Idaho, died March 2. Mr. Hindle was well known in the foundry industry. He was graduated from Purdue University in 1925, spent three years with American Steel Foundries at Alliance, Ohio, and Indiana Harbor, Ind., and in 1928 joined FOUNDRY as assistant editor. In 1933



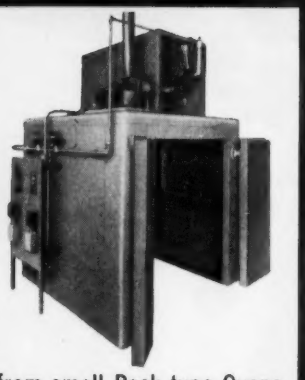
NORMAN F. HINDLE

he became connected with the American Foundrymen's Society, was appointed assistant technical secretary in 1936 and technical secretary in 1938. He was assistant secretary from 1940 to 1944 when he became director of the technical development program. During his work with AFS, Mr. Hindle was instrumental in the preparation of a number of first editions of books, including *Cast Metals Handbook, Alloy Cast Irons, Cupola Handbook,* and *Analysis of Castings Defects.*

Louis Earl Paltenghi, 61, vice president and general manager, H. C. Macauley Foundry Co., Berkeley, Calif., died Mar. 8. A former trustee of the Foundry Educational Foundation, Mr. Paltenghi also was active in the Gray Iron Founders' Society. He was a director of GIFS in 1956-59, and in 1955 received a citation from that organization for his work in the industry and the society.

Leo A. Behrendt, 62, vice president, Joseph Dixon Crucible Co., Jersey City, N. J., died Feb. 11, in Hawaii. He attended University of

LANLY heat processing equipment for the FOUNDRY INDUSTRY



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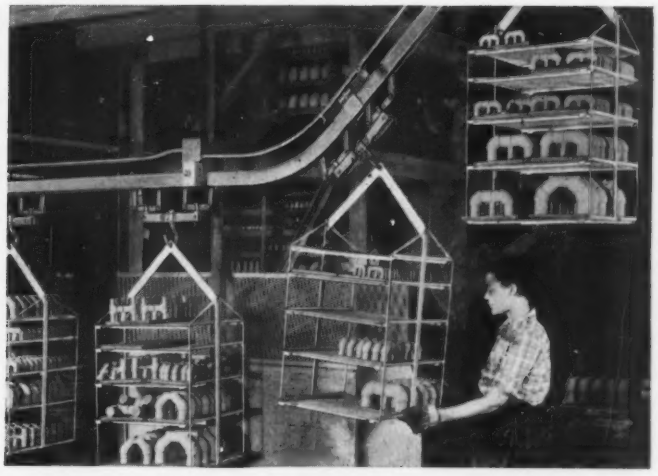

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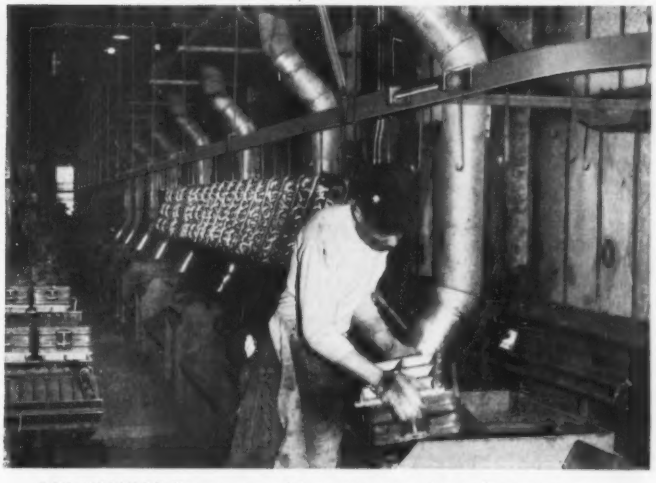

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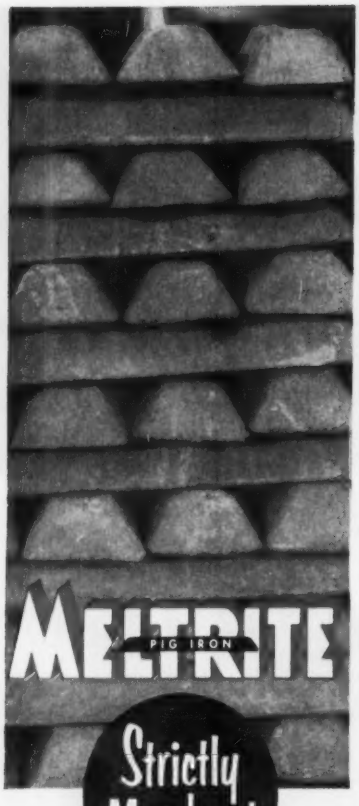

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Illinois and in 1926 joined Chicago Crucible Co., Chicago, later the American Crucible Co. In 1941 Mr. Behrendt joined Joseph Dixon as manager of its crucible division and became vice president in 1948. He was president of the Crucible Manufacturers' Association in 1947-48.

Fritz B. Ernst, 81, former vice president, American Steel Foundries, Chicago, died Feb. 25. He retired in 1947 after 40 years with the company.

Albert J. Dempsey, 65, since 1953 vice president, Crucible Steel Casting Co., Milwaukee, died Feb. 25. A graduate of Milwaukee School of Engineering, in 1923 he joined South Side Malleable Co., which became Crucible Steel in 1932. He was also a consultant for the parent firm, Consolidated Foundries & Mfg. Corp., Chicago.

Louis W. Olson, 80, long associated with Ohio Brass Co., Mansfield, Ohio, died Dec. 15. A graduate of University of Wisconsin, he joined the company in 1901 and served as draftsman, factory superintendent and manager. Since his retirement he had been living in Phoenix, Ariz. Mr. Olson was president of the American Foundrymen's Society in 1924-25.

Anthony Konieczny, 72, former president, Columbia Pattern Works, Cleveland, died Feb. 20. He retired four years ago.

Howard J. Williams, director and retired sales manager, New Jersey Silica Sand Co., Millville, N. J., died Feb. 5. He retired in 1957. Mr. Williams joined the company in 1927 as plant superintendent. He was active in the Philadelphia Chapter of the American Foundrymen's Society and served for many years in national committee work of the AFS Sand Division.

Henry J. Langsenkamp, 93, cofounder, Langsenkamp - Wheeler Brass Works Inc., Indianapolis, died Feb. 27. He learned the foundry trade from his father and in the early 90's, with his brother, the late William Langsenkamp Jr., founded Langsenkamp Bros. Brass Works. In 1895 the firm was moved and

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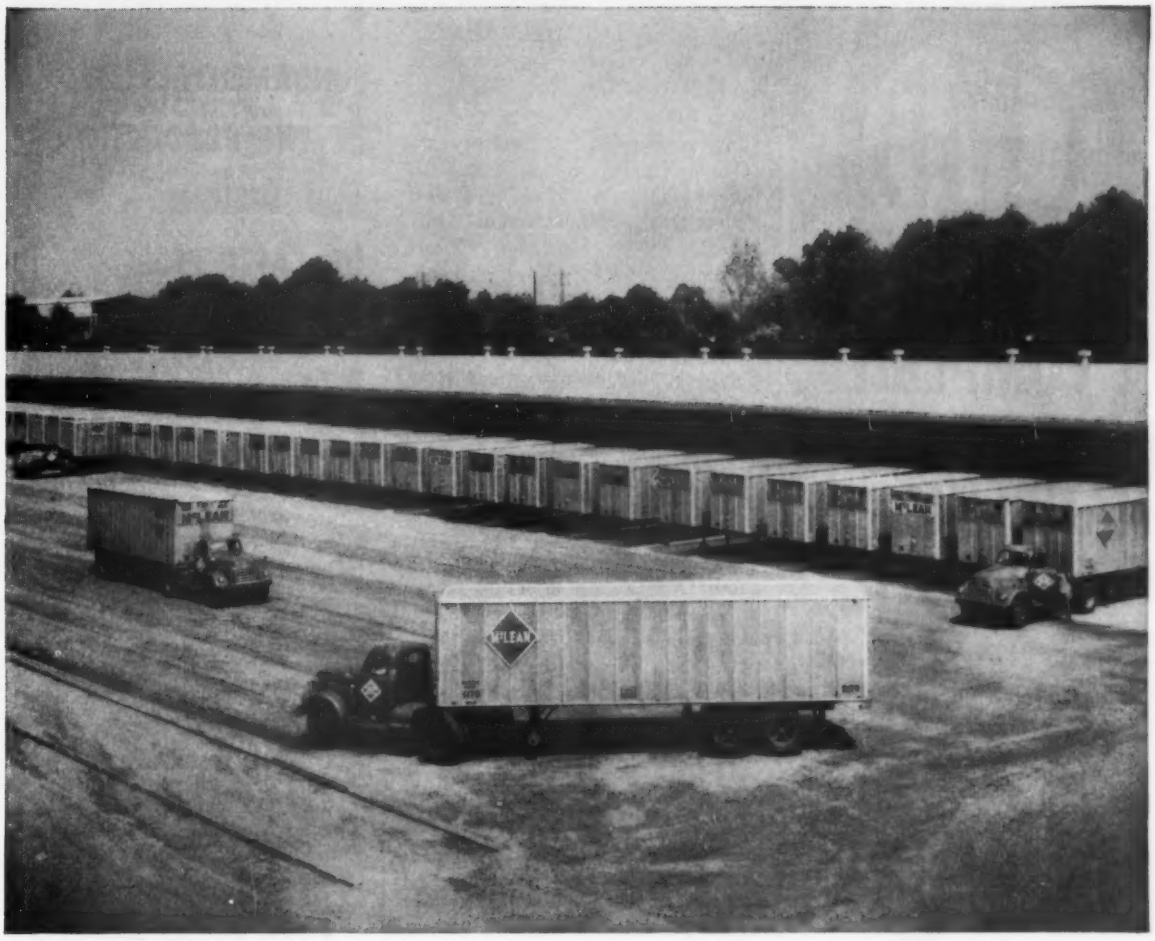

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the present name adopted. He was also a co-founder of L & L Mfg. Co. and until recently was secretary, Stickle Steam Specialties Co.

Albert Shepherd, a foundry superintendent for over 40 years until his retirement 15 years ago, died Feb. 4 at his home in Granby, Mo. His connections included Hobart Mfg. Co., Troy, Ohio, Advance Pump & Compressor Co. and Advance Rumely Co., Battle Creek, Mich.

O. C. Bueg, owner, Arrow Pattern & Engineering Co., Erie, Pa., and chairman of the AFS Pattern Division, died Feb. 7.

Henning Klouman, 69, assistant to the plant manager, Bendix Lakeshore Div., Bendix Aviation Corp., St. Joseph, Mich., died Jan. 17. Previously he was with Michiana Products Corp., Michigan City, Ind., for 38 years. He was a charter member and former chairman of the AFS Michiana Chapter.

C. W. Coats, foundry superintendent, Fuller Mfg. Co., Kalamazoo, Mich., died recently.

Fred W. McWane, 69, assistant to the president, Lynchburg Foundry Co., Lynchburg, Va., died suddenly Mar. 2 in South Boston, Mass. A graduate of Washington and Lee University, Mr. McWane was a member of the family which has headed the foundry for many years.

Jerry L. Mahoney, 69, former treasurer, St. Louis Steel Casting Inc., St. Louis, died Mar. 3. He retired last year after 35 years with the company.

Raymond F. Sherwin, 60, assistant secretary, manager of the welding rod division, and a trustee of Chicago Hardware Foundry Co., North Chicago, Ill., died Mar. 9.

Russell Tucker, 66, manufacturers' representative for Elkhart Foundry & Machine Co., and Sterling Brass Foundry, Elkhart, Ind., died Jan. 12.

Arthur S. Leach, 79, owner of the former Model Brass Co., Dallas, died Jan. 9. He retired 11 years ago.

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This book stresses the fact economy of production as a basic requisite of good casting design. Techniques, skills and practices in casting production are all developed in such a manner as to support the principal objective—that of correlating casting design with economical production.

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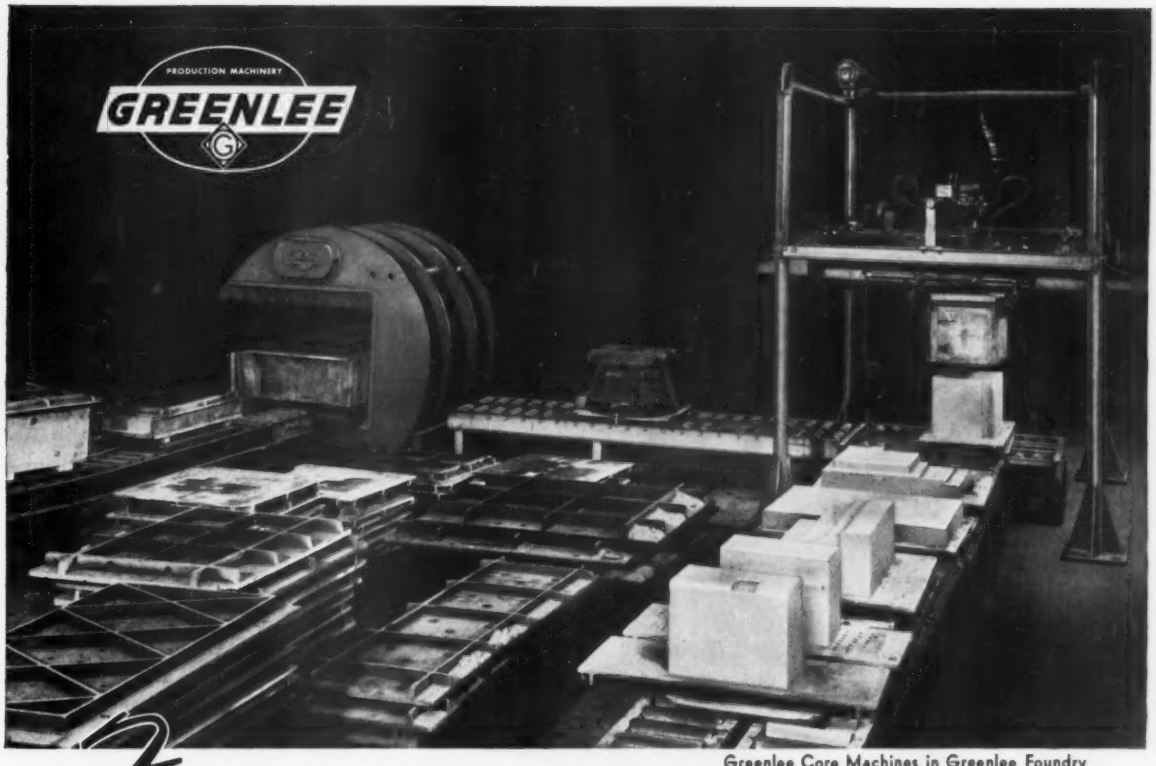

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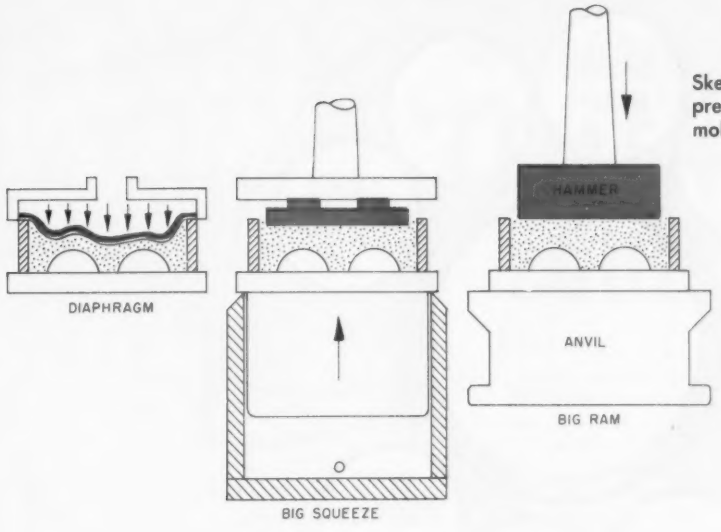
Trouble Shooting

By C. W. AMMEN



Sketches indicate various methods of high-pressure molding. Left to right, diaphragm molding, heavy squeeze, impact ramming

High-Pressure Molding

Dear Charlie:

We got all steamed up by an article on high-pressure molding as a low-cost method of producing precise castings. We purchased a very large squeezer in relation to our mold size and, although we followed details in the article, proceeded to make a grand mess of things. Not only did we miss out on the close tolerances, but also we made some high-pressure scrap. When we got the sand where it would flow, we had washes, etc., and when we got it bonded to no flowability, we couldn't make decent molds. In our search for a low-cost method by way of the big squeeze, all we accomplished was increased cost. Have we chosen the wrong method?

Sincerely,
Sam

Dear Sam:

I'll not take sides on the various molding methods. They are all good. Every one is looking for the same thing you are and you will find that each method has its limitations and problems. High-pressure molding—whether by use of a diaphragm, squeezing, or other means—is for the most part as successful as the follow through and associated operations.

A western foundry, for example, purchased high-pressure, automatic molding equipment and, after several months of spasmodic operation and results, gave it up as a bad deal. Blame fell on the equipment, as it so often does. For the most part, this result is not only wrong, but sad. Investigation showed that the fault lay in the associated equipment and operations—improper pattern equipment, sand preparation, control, and flask equipment, plus a closed mind in the shop and office. The point I wish to make is that unless you are willing to spend the time and effort necessary to develop suitable materals and procedures, your work with high-pressure equipment will bog down and give you poor and misleading results.

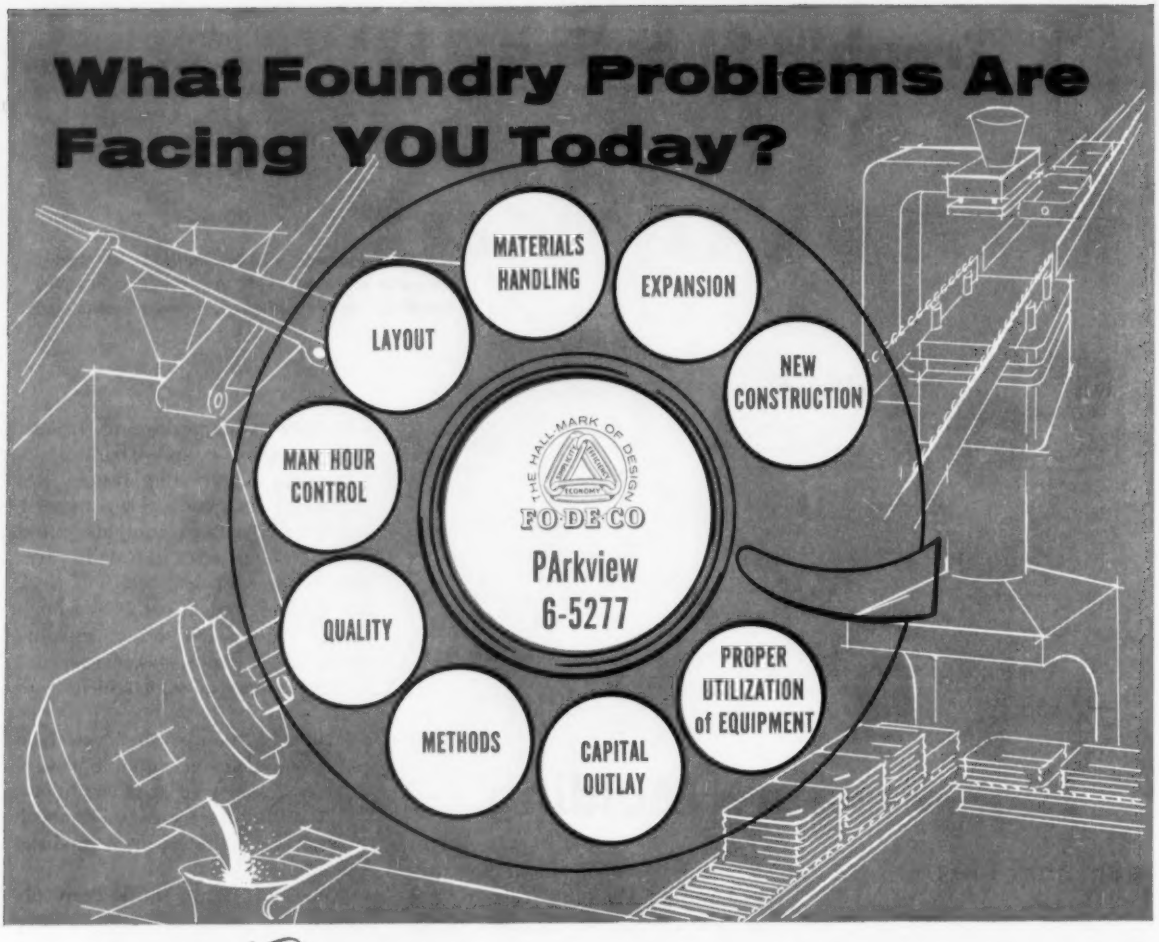
If you have a sand laboratory, a good sand conditioning system, lots of control and know-how, properly constructed pattern equipment and flasks, and enough coconuts to carry you, it's a good deal and will work out fine. If not, leave well enough alone. Like any other molding method, the whole system depends largely on proper sand and its control.

My suggestion is that you hold your big squeezer conditions constant and vary your sand conditions. Keep sufficient records to establish the set of conditons which produces the highest yield.

Excellent results have been obtained by using a 6-screen sharp sand bonded lightly with southern bentonite and worked very dry. With regularly bonded synthetic sands, the only system I have seen work with success is high-pressure impact ramming. Such ramming appears to impart an action that is not duplicated by any other method of applying pressure. High-pressure ramming has been done with a punch press, a boarddrop forging hammer, and by heavy use of the pneumatic rammer.

The idea behind high-pressure molding is simplicity plus application of sufficient pressure to a flowable sand to pack the grains tightly together to form a rigid mold. Additionally, the cavity in the mold must reproduce the pattern contour accurately. The method of applying this pressure is not nearly as important as the material subjected to this pressure and control of the material.

In the absence of flowability, you must ram heavily to provide the necessary mold hardness. A small flask and pattern rigged to be



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Circle 744 on Page 53

rammed in a standard specimen ramming device has been used to advantage in comparison work and for correlation to shop practice. However, findings in the laboratory often cannot be duplicated in the shops.

Firms producing molding equipment, etc., are your greatest source of information. If listened to with an open mind they will steer you straight. As stated before, however, you cannot plunk down equipment in a shop and expect it to perform perfectly right off the bat. A lot of work and close attention to details are required before success results.

Most operators at the outset choose a good base sand with a nice screen spread and slowly increase bond and moisture until satisfactory results are obtained. Then by close control they keep the sand within established limits.

Here are some typical high-pressure mixes which have been used successfully on a special contour, impact-punch molding machine: 1. 7 per cent milled fire clay, 3 per cent water, 4 per cent airfloat seacoal, remainder sharp sand. 2. 4 per cent southern bentonite, 3 per cent water, 4 per cent airfloat seacoal, remainder sharp sand. 3. 4 per cent southern bentonite, 3 per cent water, 10 per cent fine natural bonded molded sand, remainder sharp sand. These might not work for you without changes, but you have a place from which to start.

Sincerely,
Charlie

Shell Molding Bibliography

A selected list of references to books, reports, and magazine articles published on shell molding from 1952 to 1958 is available from the Engineering Societies Library, 29 West 39th St., New York 18, N. Y. at $2. Material covers theory, principles, production practice in large and small ferrous and nonferrous foundries, materials, design, testing methods, equipment, and costs. Papers listed describe application of shell molding to manufacture of crankshafts and other automotive parts, waveguides, heaters, electric motor parts, gears, seal rings, valves, pipe flanges, bells, etc.

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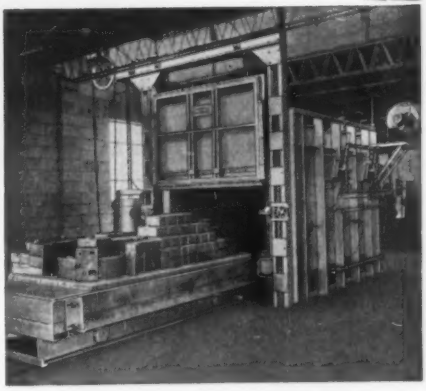

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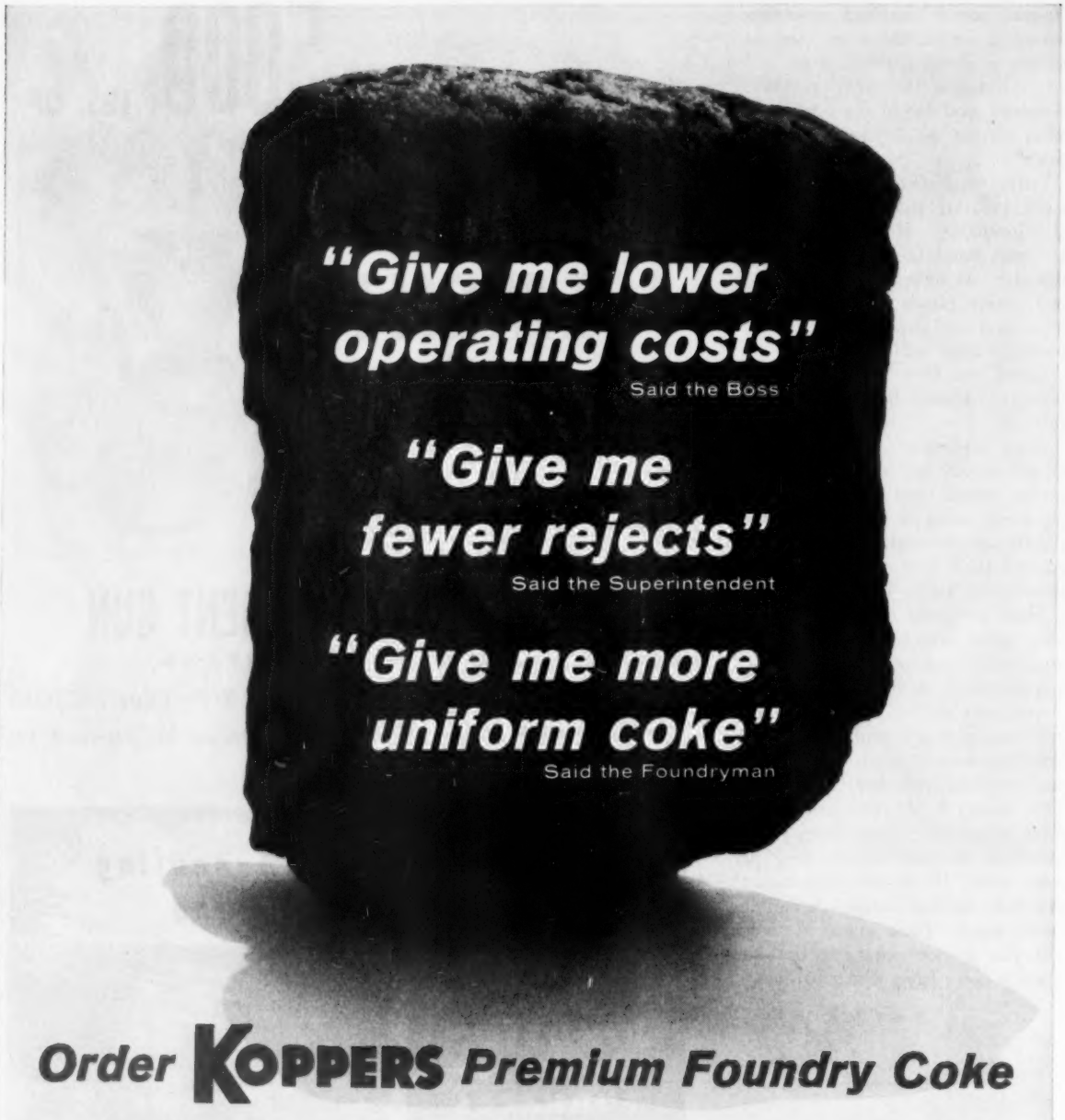

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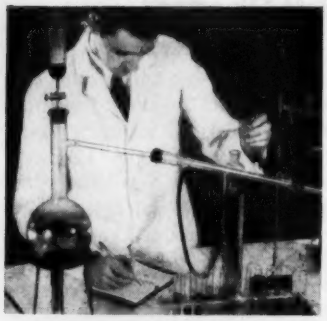

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By WILLIAM G. GUDE
Managing Editor

● ANOTHER in the long series of successful regional conferences conducted by foundrymen of the Southeast was held at the Tutwiler Hotel, Birmingham, Feb. 26-27.

Sponsored by the Birmingham District, Tennessee, and University of Alabama Student Chapters of the American Foundrymen's Society, it was the 27th of these meetings. Heading the committee in charge of the conference were the Birmingham and Tennessee chapter chairmen—Maurice Neptune, National Works, James B. Clow & Sons Inc., Birmingham, and Jack Austin, U. S. Pipe & Foundry Co., Chattanooga.

Practical operating topics, as well as subjects of particular interest to foundry management, were included in the two-day program. One morning was devoted to plant visitations.

Recent activities of the national association were discussed at the opening session by William W. Maloney, AFS general manager. Commenting on plans for the construction of the new Technical and Research Institute Building at Des Plaines, Ill., he said it is not intended to confine the society's future research activities to that location. Such work will continue to be conducted at sites for which it is best suited.

Management's Task in Building and Organization — Management's initial task is to develop and define its company's policy, philosophy, and objectives in a clear and comprehensive manner, according to Dr. Fred A. Replogle, partner, Rohrer, Hibler, & Replogle, Chicago.

Philosophy of management is more important than the special skills which management may have. We plan where we want to go before deciding how we want to get there. An organization is more than charts and job descriptions, and it should be tailor-made to fit the particular goals which management wants to achieve. It also should have a clear-cut, well understood pattern so that each person knows his individual responsibilities.

Organizational methods should be checked regularly to see whether company goals are being achieved, and goals shoud be analyzed to determine whether they are adequate to realize the basic policies in line with company philosophy. An understanding of human beings and their selection, development, and supervision is management's major task in building an organization. Because many individuals cannot make valid judgments about people, outside specialists are useful in coaching and developing management leaders of the future.

Industrial Noise and the Foundry Industry—Loss of hearing caused by a worker's environment eventually will be compensable in most states, it was predicted by Floyd E. Frazier, director, Industrial Division, National Association of Mutual Casualty Companies. For this reason he urged industry to push for fair laws and standards covering compensation and to reduce noise levels in its plants.

Tracing legal developments to date in claims for hearing loss, principally in Wisconsin and New York, Mr. Frazier pointed out that the problem is complicated by the fact that it is normal for an individual to lose some hearing ability as he ages, even though not working in a noisy area.

For means of correcting excessive noise, the new AFS manual on this subject is a good guide. A noise problem may be considered to exist where two people cannot converse within arm's length of each other.

Location and Dimensioning of Risers—As means of retaining heat in risers, insulating sleeves and top shields do not act the same with different metals, it was explained by Clyde M. Adams Jr., Massachusetts Institute of Technology. For instance, insulation is four times more effective with aluminum than with steel and twice as effective as with copper, for risers of the same size. At the same time a shield such as a gypsum cover will retard solidification of a steel riser markedly, but has little effect on aluminum.

An open steel riser with no insulation will lose 42 per cent of its heat to the atmosphere, compared with 26 per cent for copper and 8 per cent for aluminum. When insulation is applied, the percentages are 64, 48, and 21, respectively. Radiation increases with an increase in riser size.

Gray iron castings produced in green sand dilate or swell and require more feed metal and larger risers to assure soundness than do similar dry-sand castings. A riser for a dry-sand casting generally will feed the casting even though the riser may be so small that it solidifies before the casting. This condition exists because virtually all the true solidification shrinkage of most gray irons has occurred by the time the casting is 20 per cent solid.

Iron Ore to Iron Castings in One Step—High cost of providing additional blast furnace capacity and diminishing supply of good coking coal are attracting attention to the numerous processes under development and in existence for the direct reduction of iron ore to metal. H. W. Lownie Jr., chief, Process Metallurgy Research, Battelle Memorial Institute, Columbus, Ohio, described these processes and indicated how they could be used by

foundries to replace the cupola melting operation.

It is estimated that the cost of cupola iron at the spout ranges from $50 to $110 a ton, depending on size of foundry and its practice. Average cost is about $58. A direct-reduction unit with 400 tons daily capacity would cost about $6 million and could produce iron at $47 a ton. A 100-ton unit costing $2.5 million could make iron at $61.50 a day.

Better Nonferrous Castings—R. A. Colton, manager, Houston Plant, Federated Metals Div., American Smelting & Refining Co., gave these recommendations for brass, bronze, and aluminum foundry practice:

Avoid large, round sprues and sharp corners in the gating system.

Use chokes, wells, and strainer cores to cut turbulence. Screens or steel wool in molds for pouring aluminum will keep out dross.

Use multiple ingates when hot spots or defects near the gate are troublesome.

If possible, gate to the surface to be machined and at the parting line.

Use thin, flat gates when gating into thin sections.

Avoid hand-cut gates if possible.

Provide space so that gates can readily be removed from the casting.

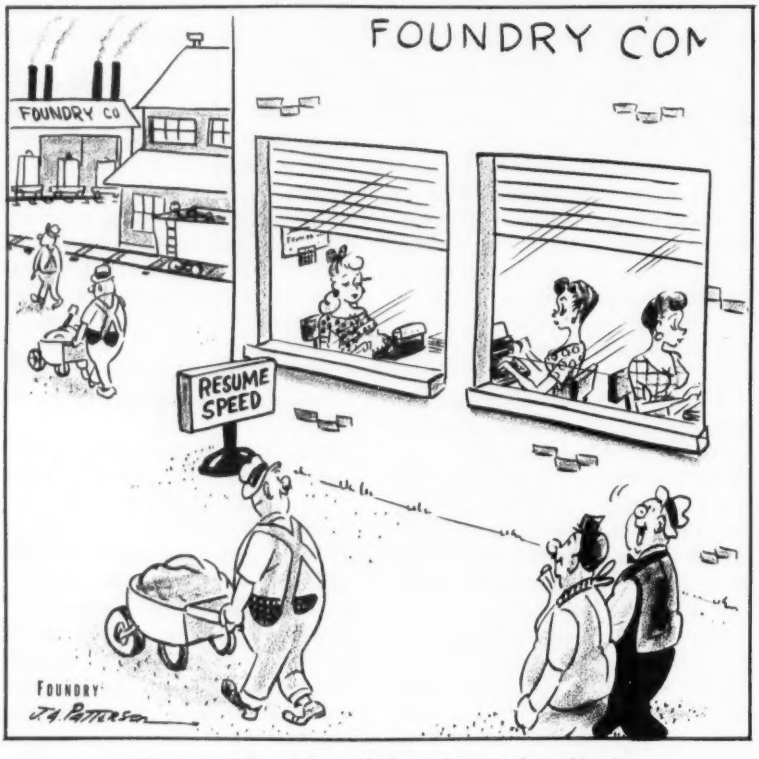
Be sure the casting is not feeding the gate.

Riser application is largely a matter of moving shrinkage cavities from the casting to the riser.

Quality Control in the Steel Foundry—Elimination of as many variables as possible in the casting process is an important key to quality control, according to Arthur F. Gross, research metallurgist, Ohio Steel Foundry Co., Springfield, Ohio. Because improper design, rather than loose control, frequently is a major cause of casting defects, attainment of correct design should be the first step in seeking a quality product.

In redesigning a complicated part, the welding together of two or more individual castings frequently offers the best solution.

Good sand control and continuous heat treating furnaces help to promote reproducibility of quality castings. The CO_2 process can increase quality by eliminating a parting line on cores and maintaining accurate dimensions. Nondestructive testing and daily investigation of causes of scrap castings are other important factors in keeping quality standards high.



"Management figured it was the best solution to the problem."

A New Approach to Foundry Automation—Details of the Buhrer automatic molding and pouring system were presented by Alex H. Homberger, president, International Automation Corp., Ann Arbor, Mich. This system, which in actual operation produces up to 300 22 x 27-in. molds per hour with a crew of nine men, exclusive of coresetters, employs a unique jolt and squeeze operation to develop high uniformity in mold hardness. A fully automatic cooling unit for maintaining control of molding sand properties also is available.

A detailed description of this equipment was presented in FOUNDRY, June, 1958, p. 70.

Preventing Casting Defects—Production of high-quality castings requires attention to melt quality, gating, feeding, and metal temperature, it was pointed out by Ray Cochran, metallurgical engineer, R. Lavin & Sons Inc., Chicago.

High melt quality necessitates use of clean, dry material; moisture-free furnace and ladle linings and tools; shortest possible charging and melting cycle; an oxidizing atmosphere, and use of lowest operating temperatures consistent with other phases of casting practice.

The most important single feature in a gating system for brass or bronze is a choke. The gating system, which has as much influence on casting quality as does melt quality, should do these things: 1. Permit the mold to fill rapidly without undue turbulence. 2. Prevent aspiration of air or gas. 3. Minimize mold and core erosion. 4. Trap dross and slag. 5. Promote directional freezing. 6. Provide maximum yield and minimum cleaning consistent with high quality.

Correct application of risers requires knowledge of the different ways in which various metals solidify. Their location must be determined by the directional solidification pattern; they should be filled with the last metal to enter the system and should not freeze before the casting section they are intended to feed. Use round risers; they remain liquid longer than rectangular ones.

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Circle 749 on Page 53

ting Process?—Most effective and profitable use of the air-setting process for hardening cores and molds has occurred where the foundry layout is designed to accommodate it, it was indicated by Daniel R. Chester, manager, core binders, Archer-Daniels-Midland Co., Cleveland. Examples were presented of corerooms arranged to utilize the process most efficiently.

It is estimated that about 400 foundries are using the process today. Its principal application other than for cores is as a dry mold facing backed up with regular molding sand. Some foundries bake the mold; others spray it with an alcohol wash. Heat from burning the wash, plus superficial heat from the metal, suffice to produce a surface skin on the mold.

Extensive research is being conducted in an effort to produce a nonbaking, high-tensile, good collapsibility type binder. Attention also is being given to the problem created by the fact that variations in sand and atmospheric temperatures affect the speed at which present binders set.

A luncheon meeting on Thursday was addressed by Herbert E. Smith Jr., president, Associated Industries of Alabama and Vulcan Rivet & Bolt Corp. He discussed certain of the industrial developments of the state.

Warren Whitney, vice president and general manager, National Works, James B. Clow & Sons Inc., was toastmaster at the annual banquet which concluded the conference. Principal speaker was AFS President Lewis H. Durdin, president, Dixie Bronze Co., Birmingham, who traced various of the historical and romantic aspects of the foundry industry since early times.

Offers Engineering Lectures

New York University College of Engineering will present several programs for practicing engineers during the summer. A one-week course on ductile iron is planned for the week of June 29. A two-day conference on vacuum metallurgy is scheduled for June 1 and 2, and on Sept. 14 and 15 the department will present its annual conference on titanium metallurgy. Each conference will cover the most recent advances in its field.

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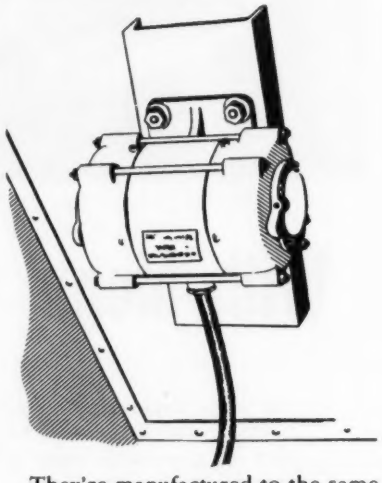

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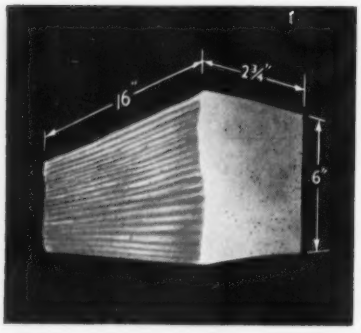
Circle 751 on Page 53



How long did it take to gouge out this 64 cubic inches of steel?

Fourteen hours' time were formerly required to chip 64 cubic inches of metal from a 5-ton reaction-type turbine casting. Using the Arcair cutting and gouging torch the job was done in 1½ hours, saving this company 12½ hours of costly, hard work, not counting clean-up time formerly required — and completely eliminated with the Arcair process!

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HOW DOES ARCAIR WORK? The 1½-lb. torch utilizes Arcair COPPERCLAD electrodes, energized by current from a welding machine to melt the metal. Air from an 80-100 p.s.i. air line travels through the torch and out tiny holes in the head, pushing the metal ahead of the worked surface. Fifteen minutes instruction is all an operator needs.

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MY PROBLEM

Circle 752 on Page 53

Courts Define the Risks Assumed by Employees

Liability of Employer Has Its Limitations

By Albert W. Gray

● EMPLOYED in an iron foundry in the St. Louis area, a workman was assigned to the assembling of sugar grinding mills.

During several months of employment in fitting guards to the rollers in these mills, he chipped away the surplus metal from ⅝-in.-thick half-cylinder-shaped covers, with a hammer and cold chisel. As he was working one day, a piece of the chipped casting struck him in the eye.

He had worn no goggles or other protection, although he knew that other employees at the same work generally did so. Suit brought by the employee against the foundry ended in a judgment in favor of the foundry. In sustaining this decision on the appeal taken by the employee, the Missouri Supreme Court said of the freedom of an employer from liability under such circumstances, that the flying chips or particles of iron were an obvious risk in the business.

That risk, the court asserted, an employee assumed when he took the job and without protest exposed himself to such risks, thus waiving the danger. Distinction between risks of this character which, under the law, are assumed by an employee and those for which the courts hold an employer responsible, was set out in the decision of an earlier case, followed as authority by this court.

Another Example — Engaged in "trimming" the loading of coal cars, separating stone and other foreign material from the coal, a workman was thrown under the wheels of the car when the moving train was jolted during coupling of additional cars.

Disposing of the contention of the employer that this injury was the result of a risk assumed by the employee as part of his work, the court made this distinction: "Should Jones employ Brown as a blacksmith, it would be the duty of the former to furnish the latter with reasonably safe tools or appliances

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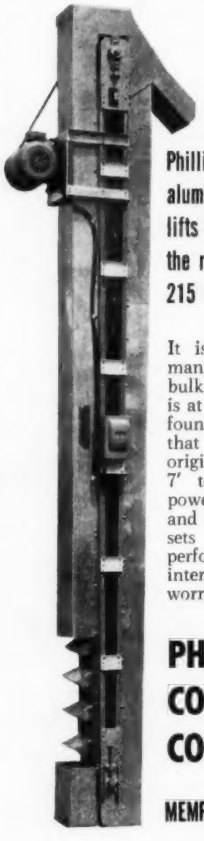

Phillips lightweight aluminum BUCKET-PHIL lifts foundry sand at the rate of 215 F.P.M.

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Circle 754 on Page 53

BEHIND THE STORY...

in next month's
POST-CONVENTION ISSUE

You'll get all the news on the AFS Castings Congress and Show in the MAY Post-Convention issue of FOUNDRY. This issue will present a complete report on all convention activities.

A special editorial section will give you the full story in words and pictures. Coverage of technical papers . . . our regular feature stories . . . late news . . . plus all usual editorial departments will highlight this informative issue.

This detailed editorial coverage will offer you a lasting record of this year's convention and show.

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with which to do that work and it would be the duty of the latter among other things to weld iron, and in order to do that it would be necessary for him to heat the ends of two pieces of iron to almost a white heat and place them in contact with each other and hammer them together and as a necessary incident hot scales and sparks will fly therefrom, which would be liable to strike him in the eye and destroy the sight thereof."

Of such circumstances the court made the characterization, "Such a liability would be a risk incident to the work undertaken in which the employer would have had no part and which the employee assumed as an implied part of his contract of employment and for such an injury he could not recover damages from his employer for the reason he assumed the risk."

On the other hand, of the liabilities imposed by the law on the employer as obligations to the workman, the court added, "But suppose the injury had occurred to his eye by reason of a sliver of steel flying from a defective hammer negligently furnished by the employer while he was pounding the iron mentioned. Such injury would be the result of negligence of the employer."

Negligence the Factor — Then summarizing this distinction the court said in conclusion, "A risk assumed by the employee is incident to the performance of the work and is one that is liable to inflict injury upon him while performing his duties to the employer in the ordinary and usual manner without the interference or negligence of the latter, but where the latter's negligence causes the injury, the assumption of risk vanishes."

When a few years ago the Supreme Court of Nebraska refused to sustain a judgment against a refining company for lead poisoning suffered by an employee, it said of the assumption of this risk assumed by the workman:

"The doctrine of assumption of risk is recognized by all the courts and often applied. The theory of law in this connection being that such dangers were contemplated by the parties in determining the wages of the servant and that the servant will then be held to carry his own insurance against any further damages growing out of the particular employment."

REFERENCES

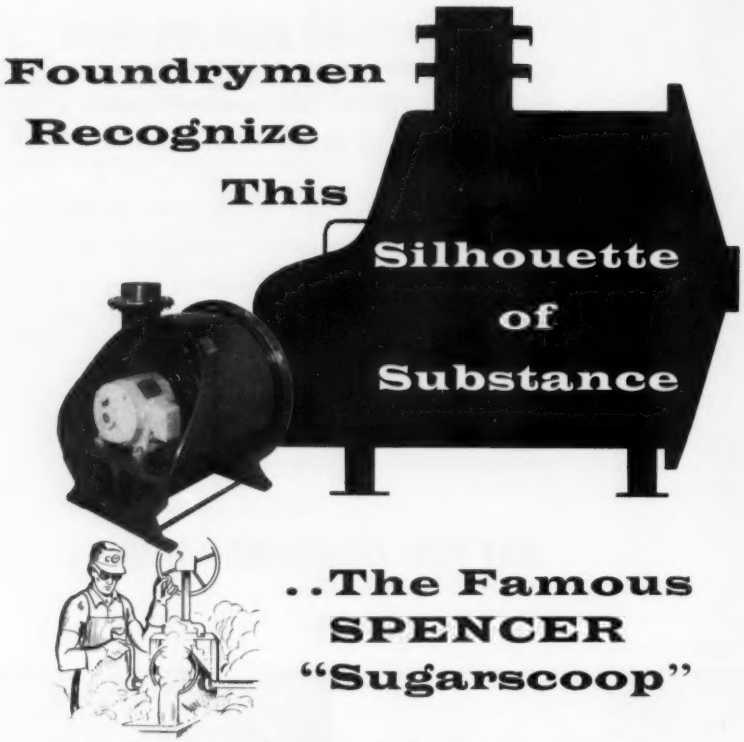
Harbacek v. Fulton Iron Works Co., 229 S.W. 803

Johnson v. Waverly Brick & Coal Co., 205 S.W. 615

Ahrens v. American Smelting & Refining Co., 272 N.W. 235

Golden Shoe Award Created

Formation of the Golden Shoe Club, an organization designed to foster and improve the practice of foot safety in industry, was announced at the recent National Safety Show. Membership is open to anyone who sustains a foot accident but escapes without injury because of wearing protective safety shoes. Candidates for membership in the club must be certified by their plant safety director and plant manager. Additional information may be secured by contacting Ed Lang, secretary, Golden Shoe Club, Hy-Test Safety Shoes Div., International Shoe Co., 1509 Washington Ave., St. Louis 66, Missouri.



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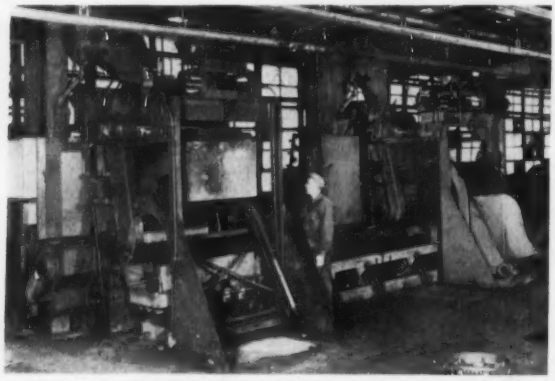
Circle 756 on Page 53

The Shakeout

Automated Barrel Cleaning Cuts Labor Costs

AUTOMATION of blast cleaning of gray iron castings at Master Electric Co., Dayton, Ohio, division of Reliance Electric & Engineering Co., is reported to have reduced labor costs 50 per cent. Three men now do the work formerly performed by six.

Master Electric pours about 50 tons of gray iron a



day and cleans approximately 33 tons in two Rotoblast barrels made by Pangborn Corp., Hagerstown, Md. A few pieces not suited for tumbling action are cleaned on a blast table. Typical castings cleaned include motor end bells, motor frames, bearing housings, and gear cases. Manpower is required only for loading and pushing the buttons that start the entirely automatic cycle on the 12-ft barrels.

For More Details Circle No. 517—Page 53

Stainless Steel Blades Strip Insulation

THE TOUGH covering on electric wires often must be removed to permit splicing or other work. To make the job safer and cheaper, Penn-Union Electric Corp., Erie, Pa., developed a peeler for Georgia Power Co., Atlanta, which uses a stainless steel casting made by the Buffalo plant of Allegheny Ludlum Steel Corp., Pittsburgh.

The peeler is hooked over the wire, tightened by hand or with a hot stick (a 6 to 10-ft pole used by power companies) until a stop is reached, then rotated around the wire until the "chip" falls away. A built-in stop positions the cutter blade correctly and prevents nicks.

The master peeler uses any of 134 interchangeable blades, each designed for one size of conductor and one thickness of covering. They cut insulation from 3/64 to 12/64 in. thick. Most power companies use conductors of only a dozen or so different sizes and need only that many types of blades. The illustration shows 7 of the 134 blades and the master peeler.

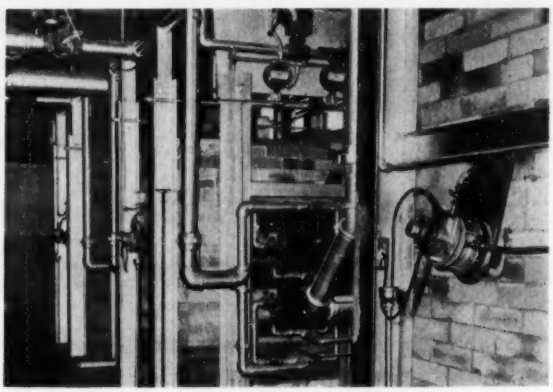
For More Details Circle No. 518—Page 53

Reheat Furnaces Test Fire Brick

RESEARCH and testing facilities of A. P. Green Fire Brick Co., Mexico, Mo., were expanded recently by installation of eight natural gas reheat furnaces and three Leeds & Northrup cam-type program control systems. Fire brick for furnace linings are tested in the furnaces.

Start-up temperature measurements are made with a Speedomax G recorder and a platinum, platinum-rhodium thermocouple. When the furnace reaches about 2650°F, control is shifted manually, through a patch panel, to a Rayotube and one of the control systems.

Finished brick are weighed and measured before being subjected to temperatures as high as 3150°F.



After soaking, during which temperatures are checked with an optical pyrometer, the brick are cooled, weighed, measured, and checked for warp. Changing a cam or gear in the program controller gives a large choice of programmed temperature cycle for a wide range of tests. The view above shows three of the furnaces with Rayotubes sighting inside on brick samples.

For More Details Circle No. 519—Page 53

Bronze Propellers Get 10-Year Guarantee

A 10-YEAR guarantee on outboard motor propellers made of Superston alloy is being offered by Columbian Bronze Corp., Freeport, N. Y. Superston is a bronze alloy developed and patented in England and being produced for propellers exclusively by Columbian.

The alloy features high tensile and fatigue strength. It has a 10 to 15 per cent manganese content, and aluminum is the other principal alloying element. Nickel also is present as an important constituent.

For More Details Circle No. 520—Page 53

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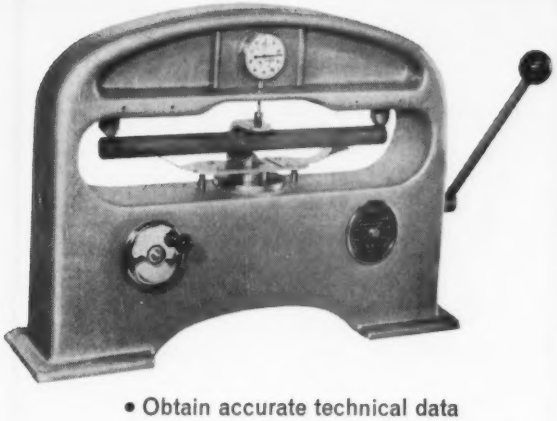
NOW...A 4 MINUTE GRAY IRON TEST



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2. Have him supply you with our simple-to-use Abrasive Cost Record form. There's no charge for these.
3. Keep the necessary records for a representative period of time.
4. Let our ASG engineer analyze your cost records, as well as your equipment, with a view to economy and efficiency.

This easy four-step process will *tell* you how much your abrasives are costing you.

And this Engineering Service might well save you hard dollars.

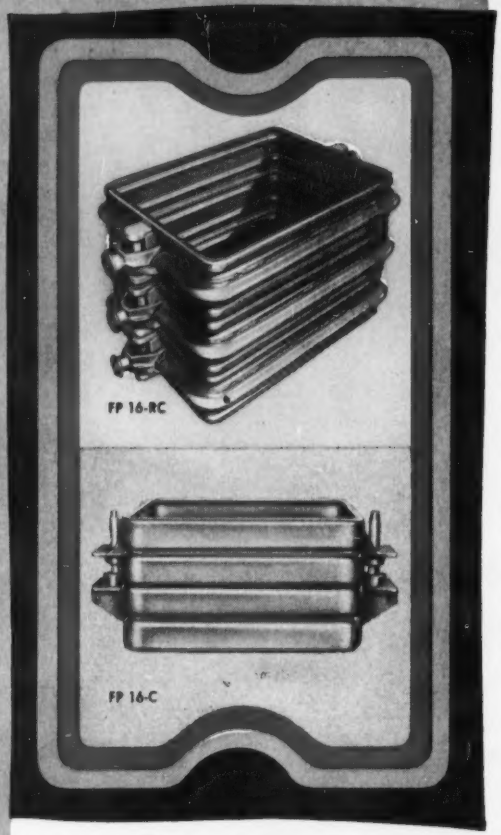
Why not call us today?

ABRASIVE SHOT & GRIT COMPANY INC.
SPRINGVILLE (Erie County) NEW YORK
Phone: Lyceum 2-2816 Teletype: Springville 502

manufacturers of BLASTRITE quality abrasives

Circle 757 on Page 53
Circle 758 on Page 53

GREATER STRENGTH–INSIDE



by *American* of course

Added strength and rigidity of these flasks by American lies in the **inside corrugation.** American **INSIDE STRENGTH** of the ¼" walls actually assures more rigidity than other type reinforcements, more resistance to squeeze of air pressure. Inside corrugation of the walls assist in holding sand—makes for easier shake out, and means that the flasks will maintain their shape and pincenters — give better, longer service.

★ Sturdy, durable streamlined design
★ Low Maintenance Cost ★ Easier to Handle

The number of inside corrugations is determined by depth of sections. For extreme pressure, sections may also be furnished with American's special channel welded reinforcement.

AFFCO superior flasks are the result of over 25 years research and best possible workmanship. Write for our new, complete Flask Catalog.

Our facilities assure you of prompt fabrication and quick shipment of your orders.

affco
Division of Cromb & Gegel, Inc.

AMERICAN FOUNDRY FLASK COMPANY
2745 SOUTHWEST BLVD.
KANSAS CITY 8, MO.

Why LEADERS *Choose* THE RIDLEY ONE-MAN GUN

FOR DAILY CUPOLA MAINTENANCE

(1) THE ONLY TRULY ONE-MAN OPERATED GUN.

(2) YOU SAVE: LABOR, MAINTENANCE, MATERIALS.

(3) BACKED BY SOLID REPUTATION OF RIDLEY (Pioneer-Engineer) IN THE AIR APPLICATION OF REFRACTORY MATERIALS.

PERFECT CIRCLE CORPORATION
PISTON RINGS - POWER SERVICE
HAGERSTOWN, INDIANA, U.S.A.

September 19, 1958

Mr. Richard L. Klosterman
Ridley and Company, Inc.,
11275 Massachusetts Avenue
Los Angeles 25, California

Dear Mr. Klosterman:

Ridley refractory guns are in use in our three Indiana foundries and our experience with them has been most satisfactory.

The convenience of one-man operation, with its resulting savings in time and labor, was the factor that first attracted us to the Ridley gun. We have since found that the large capacity of the Ridley gun, which eliminates repeated reloading, also results in a savings.

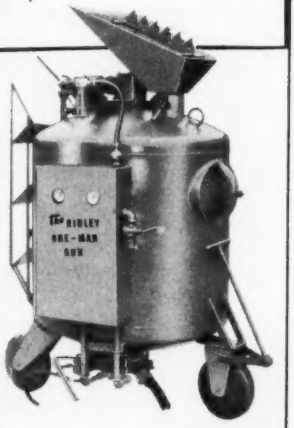
With your product, we are able to use a finer grain refractory material. We find this has cut waste since the material clings to the wall of the cupola. We have been able to cut lining time in half, and we anticipate longer service from our Ridley guns. Nozzle control, more power and a longer hose are other features we find to our liking.

At our Rushville foundry, where formerly we repaired cupolas with block, use of the Ridley gun has eliminated overtime and resulted in an actual savings of $15,211 in one year's time.

With such excellent performance, we're highly pleased with our Ridley refractory guns.

Sincerely,

Chesly B. Juday, Plant Manager
PERFECT CIRCLE CORPORATION
NEW CASTLE PLANT
h



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Pennsylvania Foundry Supply and Sand Co.
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Philadelphia 24, Pa.

or write directly to —

RIDLEY AND COMPANY, INC.
11275 MASSACHUSETTS AVENUE
LOS ANGELES 25, CALIFORNIA

Circle 759 on Page 53

Circle 760 on Page 53

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Niagara Falls, N. Y.
Kaiser Aluminum & Chemical Corp.
Kaiser Bldg.
Oakland 12, Calif.
Olin Mathieson Chemical Corp.
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Reynolds Metals Co.
Richmond 18, Va.
George Sall Metals Co.
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Philadelphia 37, Pa.
Vanadium Corp. of America
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New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

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ARGON—See GAS

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New York 36, N. Y.
Foundry Educational Foundation
Terminal Tower Bldg.
Cleveland 13, Ohio.

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Chicago 9, Ill.
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B. F. Goodrich Co.
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246 Washington Road
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Whitehead Bros. Co.
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New York 11, N. Y.

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Robeson Process Co.
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Chicago 6, Ill.
Delta Oil Products Co.
6263 Cedarburg Rd.
Milwaukee 9, Wis.
Hercules Powder Co.
Wilmington 99, Del.
E. F. Houghton Co.
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Philadelphia 33, Pa.
Penola Oil Co.
14300 McNichols Road, West
Detroit 35, Mich.
Reichhold Chemicals, Inc.
525 N. Broadway
White Plains, N. Y.
Smith Oil & Refining Co.
1102 Kilburn Ave.
Rockford, Ill.
Frederic B. Stevens, Inc.
16th & Vernor Highway
Detroit 16, Mich.
Thiem Products Co.
9800 W. Rogers
Milwaukee 14, Wis.

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324 W. 23rd St.
New York 11, N. Y.
Frederic B. Stevens, Inc.
16th & Vernor Highway
Detroit 16, Mich.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

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The Borden Company
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New York 17, N. Y.
Delta Oil Products Co.
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Milwaukee 9, Wis.
Durez Plastics Div., Hooker Chemical Corp.
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North Tonawanda, N. Y.
General Electric Co.
Chemical Materials Dept.
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Pittsfield, Mass.
Hercules Powder Co.
Wilmington 99, Del.
Reichhold Chemicals, Inc.
525 N. Broadway,
White Plains, N. Y.
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Whitehead Bros. Co.
324 W. 23rd St.
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5200 River Road
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Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Neff & Fry Co.
Camden, Ohio.
Newaygo Engineering Co.
Newaygo, Mich.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Webster Mfg. Co.
Tiffin, Ohio.
Westover Corp.
Nomad Equipment Div.
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Milwaukee 10, Wis.

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Cleveland 2, Ohio.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway
Detroit 16, Mich.
United States Graphite Co.
Saginaw, Mich.

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Wheelabrator Corp.
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Mishawaka, Ind.

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Wheelabrator Corp.
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Mishawaka, Ind.

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Minneapolis 13, Minn.
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Archer-Daniels-Midland Co.
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Union Steel Products Co.
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Milwaukee 10, Wis.

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Jeffrey Mfg. Co.
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Columbus 16, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Modern Equipment Co.
Port Washington, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Newaygo Engineering Co.
Newaygo, Mich.
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National Carbon Co.
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Fisher Furnace Div.
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Norton Co.
Worcester 6, Mass.
Chas. Taylor Sons Co.
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Leavenworth, Kans.
Jeffrey Mfg. Co.
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Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Sterling National Industries Inc.
7036 W. Walker St.
Milwaukee 14, Wis.

Webster Mfg. Co.
Tiffin, Ohio.

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Cleveland 2, Ohio.
Cleveland Chaplet & Mfg. Co.
26470 Lakeland Blvd.
Cleveland 23, Ohio.
Combined Supply & Equipment Co., Inc.
215 Chandler St.
Buffalo 7, N. Y.
Fanner Mfg. Co.
Brookside Park
Cleveland 9, Ohio.
Milwaukee Chaplet & Mfg. Co.
1023 S. 40th St.
Milwaukee 4, Wis.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway
Detroit 16, Mich.

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(Grindle Division)
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Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
Wickliffe, Ohio.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Modern Equipment Co.
Port Washington, Wis.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Shepard-Niles Crane & Hoist Corp.
Montour Falls, N. Y.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

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General Chemical Division
Allied Chemical Corp.
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New York 6, N. Y.
Hercules Powder Co.
Wilmington 99, Del.
Olin Mathieson Chemical Corp.
400 Park Ave.
New York, N. Y.
Philadelphia Quartz Co.
1062 Public Ledger Bldg.
Philadelphia 6, Pa.
Reichhold Chemicals, Inc.
525 N. Broadway
White Plains, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.

CHILLS

Combined Supply & Equipment Co., Inc.
215 Chandler St.
Buffalo 7, N. Y.
Fanner Mfg. Co.
Brookside Park
Cleveland 9, Ohio.
Milwaukee Chaplet & Mfg. Co.
1023 S. Fourth St.
Milwaukee 4, Wis.
Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.
Standard Horse Nail Corp.
New Brighton, Pa.

CHILL COATINGS

Acheson Colloids Co.
Port Huron, Mich.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.

CHIPPERS—See PNEUMATIC TOOLS

CHROMIUM (Briquets)

Union Carbide Metals Co.
Div. Union Carbide Corp.
30 East 42nd St.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 6, N. Y.

CLAMPS (Flask)

American Foundry Flask Co.
2745 Southwest Blvd.
Kansas City, Mo.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Herman Pneumatic Machine Co.
Union Bank Bldg.
Pittsburgh 22, Pa.
Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.
Sterling National Industries, Inc.
7036 W. Walker St.
Milwaukee 14, Wis.

CLAY (Bonding)

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Baroid Chemicals Inc.
Sub. National Lead Co.
P.O. Box 1675
Houston 2, Texas.
Carpenter Brothers, Inc.
606 West Wisconsin Ave.
Milwaukee 3, Wis.
Eastern Clay Products Dept.
International Minerals & Chemical Corp.
20 N. Wacker Dr.
Chicago 6, Ill.
A. P. Green Fire Brick Co.
Mexico, Mo.
Harbison-Walker Refractories Co.
307 Fifth Ave.
Pittsburgh 22, Pa.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Illinois Clay Products Co.
Joliet, Ill.
Ironton Fire Brick Co.
Ironton, Ohio.
Magnet Cove Barium Corp.
3403 Buffalo Speedway
Houston, Tex.
North American Refractories Co.
E. 6th National City Bank Bldg.
Cleveland 14, Ohio.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

CLAY (Refractory)—See REFRACTORIES

CLEANING COMPOUNDS

Combined Supply & Equipment Co., Inc.
215 Chandler St.
Buffalo 7, N. Y.
Philadelphia Quartz Co.
1062 Public Ledger Bldg.
Philadelphia 6, Pa.

COKE (Oven)

Alabama By-Products Corp.
Post Office Box 354
Birmingham 1, Ala.
DeBardeleben Coal Corp.
2201 First Ave. N.
Birmingham 3, Ala.
Diamond Alkali Co.
300 Union Commerce Bldg.
Cleveland 14, Ohio.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Koppers Co., Inc.
Kearny, New Jersey
Pickands, Mather & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Pittsburgh Coke & Chemical Co.
Grant Bldg.
Pittsburgh 19, Pa.
Semet Solvay Div.
Allied Chemical Corp.
40 Rector St.
New York 6, N. Y.

COKE (Petroleum)

Great Lakes Carbon Corp.
18 E. 48th St.
New York 17, N. Y.

COMPRESSORS (Air)

Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Curtis Pneumatic Machinery Div.
Curtis Mfg. Co.
1905 Kienlen Ave.
St. Louis 20, Mo.
Davey Compressor Co.
Kent, Ohio.
Fuller Company
Catasauqua, Pa.
Gardner-Denver Co.
Gardner Drive
Quincy, Ill.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Spencer Turbine Co.
Hartford, Conn.

CONTROL EQUIPMENT (Cupola)

Foxboro Company
Foxboro, Mass.
Leeds & Northrup
4901 Stenton Ave.
Philadelphia 44, Pa.

CONVERTERS (Bessemer)

Whiting Corporation
15607 Lathrop Ave.
Harvey, Ill.

CONVEYOR DESIGN

Ajax Flexible Coupling Co. Inc.
Westfield, N. Y.
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
C & S Products Co.
18656 Fitzpatrick Ave.
Detroit 28, Mich.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Mathews Conveyer Co.
104 Tenth St.
Ellwood City, Pa.
Planet Corp.
1820 Sunset
Lansing, Mich.
Webster Mfg. Co.
Tiffin, Ohio.

CONVEYORS (Chain)

Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Logan Co.
580 Cabel
Louisville, Ky.
Mathews Conveyer Co.
104 Tenth St.
Ellwood City, Pa.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Newaygo Engineering Co.
Newaygo, Mich.
Planet Corp.
1820 Sunset
Lansing, Mich.
Richards-Wilcox Mfg. Co.
174 Third St.
Aurora, Ill.
Standard Conveyor Co.
North St. Paul 9, Minn.
Webster Mfg. Co.
Tiffin, Ohio.

CONVEYORS (Fabric, Rubber Belt)

Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero
Chicago 39, Ill.
C & S Products Co.
18656 Fitzpatrick Ave.
Detroit 28, Mich.
Chain Belt Co.
Milwaukee 1, Wis.
B. F. Goodrich Co.
Akron 18, Ohio.
Great Western Mfg. Co.
Leavenworth, Kans.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Logan Co.
580 Cabel
Louisville, Ky.
Mathews Conveyer Co.
104 Tenth St.
Ellwood City, Pa.
Modern Equipment Co.
Port Washington, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
New London Engineering Co.
New London, Conn.
Newaygo Engineering Co.
Newaygo, Mich.
Pekay Machine & Engineering Co.
865 N. Sangamon St.
Chicago 22, Ill.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Standard Conveyor Co.
North St. Paul 9, Minn.
United States Rubber Co.
1230 Ave. of the Americas
New York 20, N. Y.
Webster Mfg. Co.
Tiffin, Ohio.
Westover Corp.
Nomad Equipment Div.
3110 W. Fond du Lac Ave.
Milwaukee 10, Wis.

CONVEYORS (Gravity Roller)

F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Logan Co.
580 Cabel
Louisville, Ky.
Mathews Conveyer Co.
104 Tenth St.
Ellwood City, Pa.
Standard Conveyor Co.
North St. Paul 9, Minn.

CONVEYORS (Live Roller)

Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Logan Co.
580 Cabel
Louisville, Ky.
Mathews Conveyer Co.
104 Tenth St.
Ellwood City, Pa.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Standard Conveyor Co.
North St. Paul 9, Minn.

CONVEYORS (Mold)

Anchor Steel & Conveyor Co.
6906 Kingsley Ave.
Dearborn, Mich.
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero
Chicago 39, Ill.
Chain Belt Co.
Milwaukee 1, Wis.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
1155 E. 283rd St.
Wickliffe, Ohio.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Logan Co.
580 Cabel
Louisville, Ky.
Mathews Conveyer Co.
104 Tenth St.
Ellwood City, Pa.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Newaygo Engineering Co.
Newaygo, Mich.
Osborn Mfg. Co.
5401 Hamilton Ave.
Cleveland 14, Ohio.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Webster Mfg. Co.
Tiffin, Ohio.
Westover Corp.
Nomad Equipment Div.
3110 W. Fond du Lac Ave.
Milwaukee 10, Wis.

CONVEYORS (Overhead Monorail)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
1155 E. 283rd St.
Wickliffe, Ohio.

F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Mathews Conveyer Co.
104 Tenth St.
Ellwood City, Pa.
Modern Equipment Co.
Port Washington, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Penn Iron Works Inc.
Reading, Pa.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Richards-Wilcox Mfg. Co.
174 Third St.
Aurora, Ill.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

CONVEYORS (Pneumatic)

Brady Conveyors Corp.
4244 Dempster St.
Skokie, Ill.
Fuller Company
Catasauqua, Pa.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Spencer Turbine Co.
Hartford, Conn.
Whirl Air Flow Corp.
650—25th Ave. S.E.
Minneapolis 14, Minn.

CONVEYORS (Portable)

C & S Products Co.
18656 Fitzpatrick Ave.
Detroit 28, Mich.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Phillips Conveyor Co.
Memphis, Missouri

CONVEYORS (Vibrating, Oscillating)

Ajax Flexible Coupling Co., Inc.
Westfield, N. Y.
Carrier Conveyor Corp.
211 N. Jackson St.
Louisville 2, Ky.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Simplicity Engineering Co.
Durand, Mich.

COPPER and COPPER SHOT

Alloy Metal Products, Inc.
Rockingham Rd.
Davenport, Iowa.
Federated Metals Div., American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.

CORE BLOWER BUSHINGS

Eastern Clay Products Dept.
International Minerals & Chemical Corp.
20 N. Wacker Drive
Chicago 6, Ill.

CORE BLOWING MACHINES

C & S Products Co.
18656 Fitzpatrick Ave.
Detroit 28, Mich.
Beardsley & Piper
Div., Pettibone Mulliken Corp.
2424 N. Cicero
Chicago 39, Ill.
Carver Foundry Products Co.
1056 Hershey Ave.
Muscatine, Iowa.
Champion Div.
Pettibone Mulliken Corp.
2424 N. Cicero
Chicago 39, Ill.
Demmler Mfg. Co.
Kewanee, Ill.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
International Molding Machine Co.
LaGrange Park, Ill.
Osborn Mfg. Co.
5401 Hamilton Ave.
Cleveland 14, Ohio.
Redford Iron & Equipment Co.
20733 Glendale Ave.
Detroit 23, Mich.
Sutter Products Co.
Hadley & Grant Sts.
Holly, Mich.

COREBOXES

Accurate Match Plate Co.
1847 W. Carroll St.
Chicago, Ill.

CORE DRAWING MACHINES—See STRIPPING, DRAWING and ROLLOVER MACHINES

COREMAKING MACHINES

Beardsley & Piper
Div., Pettibone Mulliken Corp.
2424 N. Cicero
Chicago 39, Ill.
Carver Foundry Products Co.
1056 Hershey Ave.
Muscatine, Iowa.
Demmler Mfg. Co.
Kewanee, Ill.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Hansberg Shooters, Inc.
3213 Central
Evanston, Ill.
Herman Pneumatic Machine Co.
Union Bank Bldg.
Pittsburgh 22, Pa.
International Molding Machine Co.
LaGrange Park, Ill.
Johnston & Jennings Div., Pettibone Mulliken Corp.
2424 N. Cicero
Chicago 39, Ill.
Redford Iron & Equipment Co.
20733 Glendale Ave.
Detroit 23, Mich.
SPO, Inc.
7500 Grand Division Ave.
Cleveland 25, Ohio.
Shell Process Inc.
Bliss & Parkside Sts.
West Springfield, Mass.
Sutter Products Co.
Hadley & Grant Sts.
Holly, Mich.
Tabor Mfg. Co., Div.
Turbo Machine Co.
Lansdale, Pa.

CORES (Annealing)

Pressed Steel Co.
Wilkes-Barre, Pa.

CORES (Strainer, Riser, Breakoff)

Louthan Corp.
East Liverpool, Ohio.
Porcelain Products, Inc.
Findlay, Ohio.
Rudow Mfg. Co.
2602 Venice Rd.
Sandusky, Ohio.
Universal Clay Products
Sandusky, Ohio.

CORE SHOOTING MACHINES

Demmler Mfg. Co.
Kewanee, Ill.
Hansberg Shooters, Inc.
3213 Central
Evanston, Ill.

CORE TESTING EQUIPMENT

Detroit Testing Machine Co.
9390 Grinnell Ave.
Detroit 13, Mich.
Harry W. Dietert Co.
9330 A Roselawn Ave.
Detroit 4, Mich.
Claud S. Gordon Co.
3000 S. Wallace
Chicago 16, Ill.

COUNTERS (Casting, Cores, Molds)

Hartley Controls Corp.
P. O. Box 290
Neenah, Wis.

COUPLINGS (Air, Hydraulic)

Airetool Mfg. Co.
Springfield, Ohio.
Bellows Co.
230 W. Market St.
Akron 3, Ohio.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
B. F. Goodrich Co.
Industrial Div.
Akron, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

COUPLINGS (Flexible, Shaft)

Ajax Flexible Coupling Co., Inc.
Westfield, N. Y.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Webster Mfg. Co.
Tiffin, Ohio.

CRANES (Bucket)

Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

CRANES (Gantry)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
Wickliffe, Ohio.
Euclid Crane & Hoist Co.
1365 Chardon Rd.
Cleveland 17, Ohio.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Modern Equipment Co.
Port Washington, Wis.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

CRANES (Jib)

American Chain & Cable Co., Inc.
Wright Hoist Div.
York, Pa.
Chisholm-Moore Hoist Div.
Columbus-McKinnon Chain Corp.
Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
Wickliffe, Ohio.
Euclid Crane & Hoist Co.
1365 Chardon Rd.
Cleveland 17, Ohio.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Modern Equipment Co.
Port Washington, Wis.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

CRANES (Monorail — Electric and Hand)

American Chain & Cable Co., Inc.
Wright Hoist Div.
York, Pa.
Chisholm-Moore Hoist Div.
Columbus-McKinnon Chain Corp.
Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
1155 E. 283rd St.
Wickliffe, Ohio.
Euclid Crane & Hoist Co.
1365 Chardon Rd.
Cleveland 17, Ohio.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Modern Equipment Co.
Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp.
Montour Falls, N. Y.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

CRANES (Self-Propelled)

American Chain & Cable Co., Inc.
Wright Hoist Div.
York, Pa.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Modern Equipment Co.
Port Washington, Wis.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

CRUCIBLES

Ajax Electrothermic Corp.
Ajax Park
Trenton, N. J.
American Refractories & Crucible Corp.
North Haven, Conn.
Crucible Manufacturers Association
11 W. 42nd St.
New York 36, N. Y.
Dixon, Joseph, Crucible Co.
Jersey City 3, N. J.
Electro Refractories & Abrasives Corp.
Vars Bldg.
Buffalo 2, N. Y.
Great Lakes Carbon Co.
18 E. 48th St.
New York 17, N. Y.
Inductotherm Corp.
412 Illinois Ave.
Delanco, N. J.
Lava Crucible Co.
Pittsburgh, Pa.
National Carbon Co., Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Ross-Tacony Crucible Co.
Tacony, Philadelphia, Pa.
Vesuvius Crucible Co.
Swissvale, Pa.

CRUSHERS (Core)

Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Newaygo Engineering Co.
Newaygo, Mich.
Simplicity Engineering Co.
Durand, Mich.

CUPOLAS

Bartlett & Snow, C. O., Co.
(Grindle Division)
6201 Harvard Ave.
Cleveland 5, Ohio.
Modern Equipment Co.
Port Washington, Wis.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

CUTOFF MACHINES (Abrasive)

Fox Grinders Inc.
Oliver Bldg.
Pittsburgh, Pa.
A. P. Green Fire Brick Co.
Mexico, Mo.
Tabor Mfg. Co., Div. Turbo Machine Co.
Lansdale, Pa.
U. S. Electrical Tool Co.
3640 Llewellyn St.
Cincinnati 23, Ohio.

CUTOFF WHEELS

Bay State Abrasive Products Co.
Westboro, Mass.
Carborundum Co.
Niagara Falls, N. Y.
Cincinnati Milling Products Div.
4701 Marburg Ave.
Cincinnati 9, Ohio.
A. P. Green Fire Brick Co.
Mexico, Mo.
Macklin Company
Jackson, Mich.
Norton Company
Worcester 6, Mass.
Raybestos-Manhattan, Inc.
Manhattan Rubber Division
Passaic, N. J.
Simonds Abrasive Co.
Tacony & Fraley Sts.
Philadelphia 37, Pa.
Union Carbide Metals Co., Div. of Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.

CYLINDERS (Air)

Bellows Co.
230 W. Market St.
Akron 3, Ohio.
Galland-Henning Mfg. Co.
2753 S. 31st St.
Milwaukee 46, Wis.
Logansport Machine Co., Inc.
Logansport, Indiana
Miller Fluid Power Co.
2040 N. Hawthorne
Melrose Park, Ill.
Tomkins-Johnson Co.
Jackson, Mich.

CYLINDERS (Hydraulic)

Bellows Co.
230 W. Market St.
Akron 3, Ohio.
Galland-Henning Mfg. Co.
2753 S. 31st St.
Milwaukee 46, Wis.
Logansport Machine Co., Inc.
Logansport, Indiana
Miller Fluid Power Co.
2040 N. Hawthorne
Melrose Park, Ill.
Tomkins-Johnson Co.
Jackson, Mich.

DEGASIFIERS and DEOXIDIZERS

Carborundum Co.
Niagara Falls, N. Y.
Cleveland Flux Co.
1026 Main St.
Cleveland 13, Ohio.
Federated Metals Div., American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
Pittsburgh Metals Purifying Co.
P.O. Box 568
Mars, Pa.

DEGASSING EQUIPMENT (Vacuum)
Centrifugal Casting Machine Co.
Tulsa, Okla.

DESIGN TESTING
Magnaflux Corp.
7300 W. Lawrence Ave.
Chicago 31, Ill.

DESULPHURIZERS
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Carpenter Brothers, Inc.
606 West Wisconsin Ave.
Milwaukee 3, Wis.
Cleveland Flux Co.
1026 Main St.
Cleveland 13, Ohio.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
Hercules Powder Co.
Wilmington 99, Del.
Modern Equipment Co.
Port Washington, Wis.
Olin Mathieson Chemical Corp.
400 Park Ave.
New York, N. Y.
Pittsburgh Metals Purifying Co.
P.O. Box 568
Mars, Pa.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

DOORS (Open Hearth)
Bailey, Wm. M., Co.
Pittsburgh 16, Pa.

DOWEL PINS
Standard Horse Nail Corp.
New Brighton, Pa.

DRESSERS (Grinding Wheel)
Carborundum Co.
Niagara Falls, N. Y.
Desmond-Stephan Mfg. Co.
Urbana, Ohio.
Norton Co.
Worcester, Mass.

DRILLS (Electric)
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Skil Corp.
5033 North Elston
Chicago 30, Ill.
U. S. Electrical Tool Co.
3640 Llewellyn St.
Cincinnati 23, Ohio.

DRILLS (Pneumatic)
Airetool Mfg. Co.
Springfield, Ohio.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Gardner-Denver Co.
Quincy, Ill.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Master Pneumatic Tool Co., Inc.
13 Krick Rd.
Bedford, Ohio.

DRIVES (Gear, Variable Speed)
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.

DRUMS (Magnetic)—See SEPARATORS (Magnetic)

DRYERS (Core)
Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
Midwest Pressure Casting Co.
1350 West Cermak Road
Chicago, Ill.

DRYERS (Mold)
Foundry Equipment Co.
1831 Columbus Rd.
Cleveland 13, Ohio.
Kirk & Blum Mfg. Co.
3108 Forrer St.
Cincinnati 9, Ohio.
Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.

DRYERS (Sand)
Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
DeVilbiss Metal Fabricators Co.
17900 Ryan Rd.
Detroit 12, Mich.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Nichols Engineering & Research Corp.
70 Pine St.
New York 5, N. Y.

DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS
American Air Filter Co., Inc.
266 Central Ave.
Louisville 8, Ky.
Bartlett & Snow, C. O., Co.
(Grindle Division)
6201 Harvard Ave.
Cleveland 5, Ohio.
De Vilbiss Metal Fabricators Co.
300 Phillips Ave.
Detroit 12, Mich.
Hawley Mfg. Co.
411 North Wabash
Wabash, Indiana
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Kirk & Blum Mfg. Co.
3108 Forrer St.
Cincinnati 9, Ohio.
Lennox Industries Inc.
Box 1294
Des Moines 5, Iowa.
Modern Equipment Co.
Port Washington, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
J. O. Ross Engineering Corp.
444 Madison Ave.
New York 17, N. Y.
Claude B. Schneible Co.
P.O. Box 296 Roosevelt Park
Detroit 32, Mich.
Tabor Mfg. Co.
Div. Turbo Machine Co.
Lansdale, Pa.
U. S. Electrical Tool Co.
3640 Llewellyn St.
Cincinnati 23, Ohio.
Western Precipitation Corp.
1016 West 9th St.
Los Angeles 15, Calif.
Wheelabrator Corp.
505 S. Byrkit
Mishawaka, Ind.

EDUCATION (Training Courses)
American Society for Metals
7301 Euclid Ave.
Cleveland 3, Ohio.

ELECTRODE HOLDERS AND BUS TUBES (Rebuilding Service)
Wilson Welding Company, Inc.
221 High St., Altizer Addition
Huntington, W. Va.

ELECTRODES, FURNACE (Graphite and Amorphous)
Great Lakes Carbon Corp.
18 E. 48th St.
New York 17, N. Y.
National Carbon Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Arcair Co.
465 South Mt. Pleasant Ave.
Lancaster, Ohio.

ELECTRODES and RODS (Welding)
Carborundum Co.
Perth Amboy, N. J.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
International Nickel Co., Inc.
67 Wall St.
New York 5, N. Y.
Linde Co., Div.
Union Carbide Corp.
420 Lexington Ave.
New York 17, N. Y.
Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.
National Carbon Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Sight Feed Generator Co.
West Alexandria, Ohio.
A. O. Smith Corp.
3533 North 27th St.
Milwaukee 1, Wis.
United States Graphite Co.
Saginaw, Mich.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

ELEVATORS (Bucket)—See BUCKETS (Elevating, Clam Shell Drag Line, Grab, LOADER, Dumping)

ELEVATORS (Pneumatic, Material Handling)
Fuller Co.
Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Edwin S. Carman
1643 Lee Road
Cleveland 18, Ohio.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Foundry Design Co.
106 S. Hanley Rd.
St. Louis 5, Mo.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Lester B. Knight & Associates, Inc.
549 W. Randolph St.
Chicago 6, Ill.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.
Modern Equipment Co.
Port Washington, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Pekay Machine & Engineering Co.
865 N. Sangamon St.
Chicago 22, Ill.
Westover Corp.
3110 W. Fond du Lac Ave.
Milwaukee 10, Wis.

EXHAUST—See DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

EXOTHERMIC COMPOUNDS
Foundry Services Inc.
1045 S. High St.
Columbus 6, Ohio.
Pittsburgh Metals Purifying Co.
P.O. Box 568
Mars, Pa.
United States Graphite Co.
Saginaw, Mich.

FABRICATORS (Metal)
DeVilbiss Metal Fabricators Co.
17900 Ryan Rd.
Detroit 12, Mich.
Kirk & Blum Mfg. Co.
3108 Forrer St.
Cincinnati 9, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Modern Equipment Co.
Port Washington, Wis.
Newaygo Engineering Co.
Newaygo, Mich.
Pekay Machine & Engineering Co.
865 N. Sangamon St.
Chicago 22, Ill.
Penn Iron Works, Inc.
Reading, Pa.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Westover Corp.
Nomad Equipment Div.
3110 W. Fond du Lac Ave.
Milwaukee 10, Wis.

FACINGS
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Delta Oil Products Co.
6263 Cedarbury Rd.
Milwaukee 9, Wis.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
National Carbon Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Penn-Ritton Co.
324 W. 23rd St.
New York 11, N. Y.
Stevens Inc., Frederic B.
18th & Vernor Highway
Detroit 16, Mich.
United States Graphite Co.
Saginaw, Mich.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

FANS—See DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

FEEDERS (Belt)
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Webster Mfg. Co.
Tiffin, Ohio.

FEEDERS (Plate)
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Fuller Company
Catasauqua, Pa.
Great Western Mfg. Co.
Leavenworth, Kans.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Newaygo Engineering Co.
Newaygo, Mich.

FEEDERS (Screw)
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.

FEEDERS (Vibrating)
Ajax Flexible Coupling Co. Inc.
Westfield, N. Y.
Carrier Conveyor Corp.
211 N. Jackson St.
Louisville 2, Ky.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Simplicity Engineering Co.
Durand, Mich.

FERROBORON
Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FERROCHROME
H. K. Bennett & Co.
342 Madison Ave.
New York 17, N. Y.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
Ohio Ferro Alloys Corp.
Canton 9, Ohio.
Pickands, Mather & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.

Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FERROCOLUMBIUM

H. K. Bennett & Co.
342 Madison Ave.
New York 17, N. Y.
Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FERROMANGANESE

H. K. Bennett & Co.
342 Madison Ave.
New York 17, N. Y.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
Ohio Ferro Alloys Corp.
Canton 9, Ohio.
Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FERROMOLYBDENUM

Climax Molybdenum Co.
500 Fifth Ave.
New York 36, N. Y.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.

FERROPHOSPHORUS

Eastern Clay Products Dept.
International Minerals & Chemical Corp.
20 N. Wacker Drive
Chicago 6, Ill.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.

FERROSILICON

H. K. Bennett & Co.
342 Madison Ave.
New York 17, N. Y.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
Keokuk Electro Metals Co.
320 Concert St.
Keokuk, Iowa.
Miller & Company
332 S. Michigan Ave.
Chicago 4, Ill.
Ohio Ferro Alloys Corp.
Canton 9, Ohio.
Pickands, Mather & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FERROTITANIUM

Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FERROTUNGSTEN

Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FERROVANADIUM

Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

FILES

Rota File Corp.
1328 58th St.
Brooklyn 19, N. Y.
Skil Corp.
5033 North Elston
Chicago 30, Ill.

FILLERS (Flask)

Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero
Chicago 39, Ill.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Newaygo Engineering Co.
Newaygo, Mich.

FILTERS and SEPARATORS (Compressed air contaminants)

American Air Filter Co.
226 Central Ave.
Louisville 8, Ky.
Bellows Co.
230 W. Market St.
Akron 3, Ohio.
Chicago Mfg. & Distributing Co.
1928 W. 46th St.
Chicago 9, Ill.
James A. Murphy & Co.
Hamilton, Ohio.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
Wheelabrator Corp.
505 S. Byrkit St.
Mishawaka, Ind.

FIRE BRICK, CLAY, SAND, STONE—See REFRACTORIES

FLASK BUSHINGS, FITTINGS and PINS

Adams Co.
Dubuque, Iowa.
American Foundry Flask Co.
2745 Southwest Blvd.
Kansas City, Mo.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Hines Flask Co.
3431 W. 140th St.
Cleveland 11, Ohio.
Newaygo Engineering Co.
Newaygo, Mich.
Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.
Smillie & Co., C. M.
1124 Woodward Hgts. Blvd.
Ferndale 20, Mich.
Sterling National Industries, Inc.
7036 W. Walker St.
Milwaukee 14, Wis.

FLASKS (Aluminum, Magnesium)

Adams Co.
Dubuque, Iowa.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Fremont Flask Co.
Fremont, Ohio.
Hines Flask Co.
3431 W. 140th St.
Cleveland 11, Ohio.
Newaygo Engineering Co.
Newaygo, Mich.

FLASKS (Slip)

Adams Co.
Dubuque, Iowa.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Fremont Flask Co.
Fremont, Ohio.
Hines Flask Co.
3431 W. 140th St.
Cleveland 11, Ohio.
Newaygo Engineering Co.
Newaygo, Mich.

FLASKS (Snap)

Adams Co.
Dubuque, Iowa.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Frederic B. Stevens, Inc.
18th & Vernor Highway
Detroit 16, Mich.
Fremont Flask Co.
Fremont, Ohio.
Hines Flask Co.
3431 W. 140th St.
Cleveland 11, Ohio.
Newaygo Engineering Co.
Newaygo, Mich.

FLASKS (Steel)

American Foundry Flask Co.
2745 Southwest Blvd.
Kansas City, Mo.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.
Sterling National Industries, Inc.
7036 W. Walker St.
Milwaukee 14, Wis.

FLASKS (Wood)

Adams Co.
Dubuque, Iowa.
Chicago Mfg. & Distributing Co.
1928 W. 46th St.
Chicago 9, Ill.

FLOORING (Non-Slip)

Harbison Walker Refractories Co.
307 Fifth Ave.
Pittsburgh 22, Pa.
Norton Co.
Worcester 6, Mass.

FLOUR (Silica)

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Ottawa Silica Co.
Ottawa, Ill.
Pennsylvania Pulverizing Co.
140 Stanwix St.
Pittsburgh 22, Pa.
Standard Silica Co.
Ottawa, Ill.
Wedron Silica Co.
135 S. LaSalle St.
Chicago 3, Ill.

FLOUR (Wood, Corncob)

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Eastern Clay Products Dept.
International Minerals & Chemical Corp.
20 N. Wacker Dr.
Chicago 6 Ill.
Michael Wood Products Co.
Midland Ave.
Garfield, New Jersey
Ti-Co Industries, Inc.
P. O. Box 185
Tipton, Indiana.

FLUXES

Cleveland Flux Co.
1026 Main St.
Cleveland 13, Ohio.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
General Chemical Division
Allied Chemical Corp.
40 Rector St.
New York 6, N. Y.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Olin Mathieson Chemical Corp.
400 Park Ave.
New York, N. Y.
Pittsburgh Metals Purifying Co.
P.O. Box 568
Mars, Pa.
Superflux Mfg. Co.
16125 Cleophus Ave.
Allen Park 10, Mich.

FLUXES (Soldering, Welding, and Tinning)

Linde Co., Div. Union Carbide Corp.
420 Lexington Ave.
New York 17, N. Y.

FOUNDRY ENGINEERS—See ENGINEERING SERVICE

FURNACES (Air)

Swindell-Dressler Corp.
Box 188
Pittsburgh 30, Pa.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

FURNACES (Electric Melting)

Ajax Electrothermic Corp.
Ajax Park
Trenton, N. J.
Ajax Engineering Corp.
Trenton, N. J.
American Bridge, Div. United States Steel Corp.
525 Wm. Penn Pl.
Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co.
Bay City, Mich.
Hevi Duty Electric Co.
P. O. Box 563
Milwaukee 1, Wis.
Inductotherm Corp.
412 Illinois Ave.
Delanco, N. J.
Lectromelt Furnace Co. Div.
McGraw Edison Co.
P.O. Box 1125
Pittsburgh, Pa.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard St.
Chicago 12, Ill.
Ohio Crankshaft Co.
Tocco Division
4620 E. 71st St.
Cleveland 5, Ohio.
Swindell-Dressler Corp.
Box 188
Pittsburgh 30, Pa.
Westinghouse Electric Corp.
2519 Wilkens Ave.
Baltimore 3, Md.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

FURNACES (Gas or Oil Fired Melting)

Campbell-Hausfeld Co.
Harrison, Ohio.
Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio.
Denver Fire Clay Co.
2301 Blake St.
Denver 2, Colo.
Foundry Equipment Co.
1831 Columbus Rd.
Cleveland 13, Ohio.
International Foundry Supply Co.
Water & Spruce Sts.
Reading, Pa.
Johnston Mfg. Co.
Minneapolis 13, Minn.
Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard,
Chicago 12, Ill.
Reda Pump Co.
Bartlesville, Okla.
Swindell-Dressler Corp.
Box 188
Pittsburgh 30, Pa.

FURNACES (Heat Treating and Annealing)

Ajax Electric Co., Inc.
Philadelphia 23, Pa.
Ajax Electrothermic Corp.
Ajax Park
Trenton, N. J.
Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio.
Foundry Equipment Co.
1831 Columbus Rd.
Cleveland 13, Ohio.
Hevi Duty Electric Co.
P. O. Box 563
Milwaukee 1, Wis.
Inductotherm Corp.
412 Illinois Ave.
Delanco, N. J.
Johnston Mfg. Co.
Minneapolis 13, Minn.
Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio.
Leeds & Northrup
4901 Stenton Ave.
Philadelphia 44, Pa.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard
Chicago 12, Ill.
Ohio Crankshaft Co.
Tocco Division
4620 E. 71st St.
Cleveland 5, Ohio.
Swindell-Dressler Corp.
Box 188
Pittsburgh 30, Pa.
Whiting Corporation
15607 Lathrop Ave.
Harvey, Ill.

GAGGERS

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.

GAS (Oxygen, Acetylene, Carbon Dioxide, Industrial)

Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
International Foundry Supply Co.
Water & Spruce Sts.
Reading, Pa.
Linde Co.
Div. Union Carbide Corp.
420 Lexington Ave.
New York 17, N. Y.
Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.
Pure Carbonic Div.
Air Reduction Co.
150 E. 42nd St.
Socony-Mobil Bldg.
New York 17, N. Y.

GASSING SYSTEMS and EQUIPMENT

Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Carver Foundry Products Co.
1056 Hershey Ave.
Muscatine, Iowa.
International Foundry Supply Co.
Water & Spruce Sts.
Reading, Pa.
Liquid Carbonic Div.
General Dynamics Corp.
135 S. LaSalle St.
Chicago 3, Ill.
Pure Carbonic Div.
Air Reduction Co.
150 E. 42nd St.
Socony-Mobil Bldg.
New York, N. Y.

GENERATORS (Acetylene)

Linde Co.
Div. Union Carbide Corp.
420 Lexington Ave.
New York 17, N. Y.
Sight Feed Generator Co.
West Alexandria, Ohio.

GENERATORS (Power)

Allis-Chalmers Mfg. Co.
Engine-Material Handling Div.
1123 S. 70th St.
Milwaukee 14, Wis.
Ready Power Co.
3826 Grand River Ave.
Detroit 8, Mich.

GLOVES — See SAFETY EQUIPMENT

GRAPHITE and GRAPHITE BRIQUETS

Acheson Colloids Co.
Port Huron, Mich.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Becker Bros. Carbon Co.
3450 South Laramie
Cicero, Ill.
Great Lakes Carbon Corp.
18 E. 48th St.
New York 17, N. Y.
National Carbon Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
Stevens, Frederic B., Inc.
18th & Vernor Highway
Detroit 16, Mich.
United States Graphite Co.
Saginaw, Mich.

GRINDERS, CORE (Power Operated)

Sutter Products Co.
Hadley & Grant Sts.
Holly, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Skil Corp.
5033 North Elston
Chicago 30, Ill.
U. S. Electrical Tool Co.
3640 Llewellyn St.
Cincinnati 23, Ohio.

GRINDERS (Pneumatic Portable)

Airetool Mfg. Co.
Springfield, Ohio.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Gardner-Denver Co.
Gardner Drive
Quincy, Ill.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Master Pneumatic Tool Co., Inc.
13 Krick Rd.
Bedford, Ohio.

GRINDERS (Bench, Disc, Floor, Surface)

Carborundum Co.
Perth Amboy, N. J.
Fox Grinders Inc.
Oliver Bldg.
Pittsburgh 22, Pa.
Grinding & Polishing
Machinery Corp.
2530 Winthrop Ave.
Indianapolis 5, Ind.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Oliver Machinery Co.
Grand Rapids 1, Mich.
U. S. Electrical Tool Co.
3640 Llewellyn St.
Cincinnati 23, Ohio.

GRINDERS (Swing Frame)

Fox Grinders, Inc.
Oliver Bldg.
Pittsburgh 22, Pa.
Grinding & Polishing
Machinery Corp.
2530 Winthrop Ave.
Indianapolis 5, Ind.
Sutter Products Co.
Hadley & Grant Sts.
Holly, Mich.
U. S. Electrical Tool Co.
3640 Llewellyn St.
Cincinnati 23, Ohio.

GRINDING WHEELS

Atlantic Abrasive
South Braintree, Mass.
Bay State Abrasive Products Co.
Westboro, Mass.
Carborundum Co.
Niagara Falls, N. Y.
Cincinnati Milling Products Div.
4701 Marburg Ave.
Cincinnati 9, Ohio.
Keystone Abrasive Wheel Co.
Carnegie, Pa.
Macklin Co.
Jackson, Mich.
Mid West Abrasive Co.
Owosso, Mich.
Norton Company
Worcester 6, Mass.
Raybestos-Manhattan, Inc.
Manhattan Rubber Division
Passaic, N. J.
Simonds Abrasive Co.
Tacony & Fraley Sts.
Philadelphia 37, Pa.
United States Rubber Co.
1230 Ave. of the Americas
New York 20, N. Y.

GRIT—See SHOT and GRIT

GUARDS (Grinding Wheel)

Carroll Pressed Metal, Inc.
131 Dewey St.
Worcester, Mass.

HARDNESS TESTING EQUIPMENT

Detroit Testing Machine Co.
9390 Grinnell Ave.
Detroit 13, Mich.
Dietert Harry W., Co.
9330A Roselawn Ave.
Detroit 4, Mich.
King Tester Corp.
440 North 13th St.
Philadelphia 23, Pa.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp.
Ajax Park
Trenton, N. J.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard
Chicago 11, Ill.
Ohio Crankshaft Co.
Tocco Div.
4620 E. 71st St.
Cleveland 5, Ohio.

HEATERS (Oven, Space, Unit, Water)

American Air Filter Co. Inc.
266 Central Ave.
Louisville 8, Ky.
Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio.
DeVilbiss Metal Fabricators Co.
17900 Ryan Rd.
Detroit 12, Mich.
Foundry Equipment Co.
1831 Columbus Rd.
Cleveland 13, Ohio.
Lanly Co.
2800 Euclid Ave.
Cleveland 15, Ohio.
Lennox Industries, Inc.
Marshalltown, Iowa.
Modern Equipment Co.
Port Washington, Wis.

HELMETS (Blasting)

American Optical Co.
Southbridge, Mass.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
Wheelabrator Corp.
505 S. Byrkit
Mishawaka, Ind.

HELMETS (Welding)

American Optical Co.
Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Curtis Pneumatic Machinery Div.
Curtis Mfg. Co.
1905 Kienlen Ave.
St. Louis 20, Mo.
Euclid Crane & Hoist Co.
1365 Chardon Rd.
Cleveland 17, Ohio.
Gardner-Denver Co.
Quincy, Ill.
Galland-Henning Mfg. Co.
2753 S. 31st St.
Milwaukee 46, Wis.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Master Pneumatic Tool Co., Inc.
13 Krick Rd.
Bedford, Ohio.
Miller Fluid Power Co.
2040 N. Hawthorne
Melrose Park, Ill.

HOISTS (Chain, Hand)

American Chain & Cable Co., Inc.
Wright Hoist Div.
York, Pa.
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Chisholm-Moore Hoist Div.
Columbus-McKinnon Chain Corp.
Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
1155 E. 283rd St.
Wickliffe, Ohio.
Euclid Crane & Hoist Co.
1365 Chardon Rd.
Cleveland 17, Ohio.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Modern Equipment Co.
Port Washington, Wis.
Yale & Towne Mfg. Co.
11000 Roosevelt Blvd.
Philadelphia 15, Pa.

HOISTS (Electric)

American Chain & Cable Co., Inc.
Wright Hoist Div.
York, Pa.
Chisholm-Moore Hoist Div.
Columbus-McKinnon Chain Corp.
Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.
1155 E. 283rd St.
Wickliffe, Ohio.
Euclid Crane & Hoist Co.
1365 Chardon Rd.
Cleveland 17, Ohio.
Harnischfeger Corp.
4400 W. National Ave.
Milwaukee 46, Wis.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Modern Equipment Co.
Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp.
Montour Falls, N. Y.
Yale & Towne Mfg. Co.
11000 Roosevelt Blvd
Philadelphia 15, Pa.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

HOISTS (Skip)

Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Gardner-Denver Co.
Quincy, Ill.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Modern Equipment Co.
Port Washington, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Newaygo Engineering Co.
Newaygo, Mich.
Webster Mfg. Co.
Tiffin, Ohio.
Whiting Corporation
15607 Lathrop Ave.
Harvey, Ill.

HOODS (Shakeout, Pouring and Cooling)—See DUST, COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

HOPPERS (Dump)

Kirk & Blum Mfg. Co.
3108 Forrer St.
Cincinnati 9, Ohio.

HOPPERS (Bulk Storage)—See BINS and GATES

HOSE (Air, Blasting, Water, Gas)

Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Gardner-Denver Co.
Quincy, Ill.
B. F. Goodrich Co.
Akron, Ohio.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
Raybestos-Manhattan, Inc.
Manhattan Rubber Div.
Passaic, N. J.
United States Rubber Co.
1230 Ave. of the Americas
New York 20, N. Y.

HOSE FITTINGS and REELS

B. F. Goodrich Co.
Industrial Div.
Akron, Ohio.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

HOT BLAST EQUIPMENT (Cupola)

Bartlett & Snow, C. O., Co.
(Grindle Division)
6201 Harvard Ave.
Cleveland 5, Ohio.
Brown Fintube Co.
Elyria, Ohio.
Modern Equipment Co.
Port Washington, Wis.
J. O. Ross Engineering Corp.
444 Madison Ave.
New York 17, N. Y.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

IMPREGNATING SYSTEMS and CASTING SEALER

Prenco Products, Inc.
507 E. Ten Mile Rd.
Hazel Park, Mich.
Tousey Varnish Co.
520 W. 25th St.
Chicago 16, Ill.
United States Gypsum Co.
300 West Adams
Chicago 6, Ill.

INGOT MOLDS

Acme Foundry Co.
2503 22nd St.
Detroit 16, Mich.
Great Lakes Carbon Corp.
18 E. 48th St.
New York 17, N. Y.

National Carbon Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.

INGOTS—(See type of metal)

INOCULANTS

Carborundum Co.
Perth Amboy, N. J.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
Great Lakes Carbon Corp.
18 E. 48th St.
New York 17, N. Y.
Union Carbide Metals Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
United States Graphite Co.
Saginaw, Mich.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

INSPECTION EQUIPMENT (Castings)

Allis-Chalmers
1123 S. 70th St.
Milwaukee 14, Wis.
Budd Co.
Nuclear Systems Div.
2950 Roberts Ave.
Philadelphia 29, Pa.
Detroit Testing Machine Co.
9390 Grinnell Ave.
Detroit 13, Mich.
Dietert, Harry W., Co.
9330A Roselawn Ave.
Detroit 4, Mich.
Eastman Kodak Co.
Rochester, N. Y.
King Tester Corp.
440 North 13th St.
Philadelphia 23, Pa.
Magnaflux Corp.
7300 W. Lawrence Ave.
Chicago 31, Ill.
Picker X-Ray Corp.
25 S. Broadway
White Plains, N. Y.
Westinghouse Electric Corp.
2519 Wilkens Ave.
Baltimore 3, Md.

INSTALLATION (Foundry Equipment)

Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Planet Corp.
1820 Sunset
Lansing 6, Mich.

IRON ORE

Pickands, Mather & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.

IRON OXIDES

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Carpenter Brothers, Inc.
606 West Wisconsin Ave.
Milwaukee 3, Wis.
Delta Oil Products Co.
6263 Cedarburg Rd.
Milwaukee 9, Wis.
Tamms Industries Co.
228 N. La Salle St.
Chicago 1, Ill.
Thiem Products Co.
9800 W. Rogers
Milwaukee 14, Wis.

IRON, PIG

Hanna Furnace Corp.
Ecorse, Detroit 29, Mich.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Keokuk Electro Metals Co.
320 Concert St.
Keokuk, Iowa.
Miller & Company
332 S. Michigan Ave.
Chicago 4, Ill.
Pickands, Mather & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Pittsburgh Coke & Chemical Co.
Grant Building
Pittsburgh 19, Pa.
Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.
Woodward Iron Co.
Woodward, Ala.

IRON, PIG (Silvery)

Hanna Furnace Corp.
Ecorse, Detroit 29, Mich.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Keokuk Electro Metals Co.
320 Concert St.
Keokuk, Iowa.
Miller & Company
332 S. Michigan Ave.
Chicago 4, Ill.
Pickands, Mather & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.

IRON, PIG (Spiegeleisen)

Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.

IRON POWDER

Hoeganaes Sponge Iron Corp.
Riverton, N. J.

IRON (Sponge)

Hoeganaes Sponge Iron Corp.
Riverton, N. J.

JACKETS (Mold)

Adams Co.
Dubuque, Iowa.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Burr Aluminum Products
Burr Oak, Mich.
Chicago Mfg. & Distributing Co.
1928 W. 46th St.
Chicago 9, Ill.
Fremont Flask Co.
Fremont, Ohio.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Hines Flask Co.
3431 W. 140th St.
Cleveland 11, Ohio.

KEYS (Machine)

Standard Horse Nail Corp.
New Brighton, Pa.

KNOCKOUT MACHINES (Core)

Allis-Chalmers Mfg. Co.
Milwaukee 1, Wis.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.

LABORATORY EQUIPMENT (Chemical)

Dietert, Harry W., Co.
9330A Roselawn Ave.
Detroit 4, Mich.
Great Western Mfg. Co.
Leavenworth, Kans.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard
Chicago 12, Ill.

LABORATORY EQUIPMENT (Physical)

Baird-Atomic, Inc.
33 University Rd.
Cambridge 38, Mass.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Dietert, Harry W., Co.
9330A Roselawn Ave.
Detroit 4, Mich.
Gordon, Claud S., Co.
3000 S. Wallace
Chicago 16, Ill.
Great Western Mfg. Co.
Leavenworth, Kans.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard
Chicago 12, Ill.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Norton Co.
Worcester 6, Mass.

LADLES

Industrial Equipment Co.
Minster, Ohio.
Modern Equipment Co.
Port Washington, Wis.
Spincraft Inc.
4122 W. State St.
Milwaukee 8, Wis.
Frederic B. Stevens, Inc.
18th & Vernor Highway
Detroit 16, Mich.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

LEAD

Federated Metals Div.
American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.
George Sall Metals Co.
2300 East Butler St.
Philadelphia 37, Pa.

LINERS (Shot Blast Equipment)

Gates Rubber Co.
999 S. Broadway
Denver 17, Colo.
Pangborn Corporation
1400 Pangborn Blvd.
Hagerstown, Md.

LINING MATERIAL (Rubber)

Goodrich, B. F., Co.
Akron 18, Ohio.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
Quaker Rubber Div.
H. K. Porter Company, Inc.
Tacony & Comly Streets
Philadelphia 24, Pa.

LIGHTERS (Cupola)

Hickman-Williams Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

LITHIUM

Lithium Corp. of America
Rand Tower
Minneapolis, Minn.

LOADERS

Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Clearfield Machine Co.
Clearfield, Pa.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Modern Equipment Co.
Port Washington, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.

LOADERS (Front-End)

Hough, Frank G., Co.
703 Sunnyside Ave.
Libertyville, Ill.
Towmotor Corp.
1226 East 152nd St.
Cleveland 10, Ohio.
Tractomotive Corp.
Deerfield, Ill.
Yale & Towne Mfg. Co.
11000 Roseveit Blvd.
Philadelphia 15, Pa.

LUBRICANTS

Acheson Colloids Co.
Port Huron, Mich.
Bellows Co.
230 W. Market St.
Akron 3, Ohio.
Cities Service Oil Co.
20 N. Wacker Dr.
Chicago 6, Ill.
New York & New Jersey
Lubricant Co.
292 Madison Ave.
New York 17, N. Y.
Silicones Division
Union Carbide Corp.
40 E. 42nd St.
New York 17, N. Y.
Smith Oil & Refining Co.
1102 Kilburn Ave.
Rockford, Ill.
United States Graphite Co.
Saginaw, Mich.

LUBRICATORS (Air Line)

Airetool Mfg. Co.
Springfield, Ohio.
Bellows Co.
230 W. Market St.
Akron 3, Ohio.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Gardner Denver Co.
Gardner Drive
Quincy, Ill.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.

MAGNESIUM INGOTS

Federated Metals Division of American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.

MAGNETIC PARTICLE TESTING

Magnaflux Corp.
7300 W. Lawrence Ave.
Chicago 31, Ill.

MANGANESE (Briquets)

Union Carbide Metals Co.
Div. Union Carbide Corp.
30 East 42nd St.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 6, N. Y.

MATCHPLATE METAL

Federated Metals Division of American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.

MATCHPLATES

Accurate Match Plate Co.
1847 W. Carroll St.
Chicago, Ill.
Champion Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Hines Flask Co.
3431 W. 140th St.
Cleveland 11, Ohio.
Midwest Pressure Casting Co.
1350 West Cermak Road
Chicago, Ill.
Moltrup Steel Products Co.
Beaver Falls, Pa.
Scientific Cast Products Corp.
1388-92 E. 40th St.
Cleveland 3, Ohio.

MEASURING and WEIGHING DEVICES

Baker Perkins, Inc.
Saginaw, Mich.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Gray Company, Inc.
60 11th Ave., Northeast
Minneapolis 13, Minn.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.

METAL CLEANING—See BLAST CLEANING EQUIPMENT

METERS (Gas, Air, Water)

Illinois Testing Laboratories, Inc.
418 N. LaSalle St.
Chicago 10, Ill.
Foxboro Company
Foxboro, Mass.

MIXERS (Core Wash)

Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.

MOLD WASH—See WASH

MOLDING MACHINES (Green Sand)

Adams Co.
Dubuque, Iowa.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
British Moulding Machine Co. Ltd.
Faversham, Kent, England
Champion Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Eastern Clay Products Dept.
International Minerals & Chemicals Corp.
20 N. Wacker Drive
Chicago 6, Ill.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada

Herman Pneumatic Machine Co.
Union Bank Bldg.
Pittsburgh 22, Pa.
International Molding Machine Co.
LaGrange Park, Ill.
Johnston & Jennings Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Osborn Mfg. Co.
5401 Hamilton Ave.
Cleveland 14, Ohio.
SPO Inc.
7500 Grand Division Ave.
Cleveland 25, Ohio.
Sutter Products Co.
Hadley & Grant Sts.
Holly, Mich.
Tabor Mfg. Co.
Div. Turbo Machine Co.
Lansdale, Pa.

MOLDING MACHINES (Shell Mold)

Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
C & S Products Co.
18656 Fitzpatrick Ave.
Detroit 28, Mich.
Centrifugal Casting Machine Co.
Tulsa, Okla.
Demmler Mfg. Co.
Kewanee, Ill.
Dependable Pattern Works
1634 S. E. Seventh Ave.
Portland 14, Oreg.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Hutchinson Shell Mold Co.
P. O. Box 188
Alton, Ill.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Osborn Mfg. Co.
5401 Hamilton Ave.
Cleveland 14, Ohio.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
SPO, Inc.
750 Grand Division Ave.
Cleveland 25, Ohio.
Shell Process Inc.
Bliss & Parkside Sts.
West Springfield, Mass.
Sutter Products Co.
Hadley & Grant Sts.
Holly, Mich.

MOLDS (Permanent)

Centrifugal Casting Machine Co.
Tulsa, Okla.
Great Lakes Carbon Corp.
18 E. 48th St.
New York 17, N. Y.
National Carbon Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.

MOLYBDENUM and COMPOUNDS

Climax Molybdenum Co.
500 Fifth Ave.
New York 36, N. Y.
Whitehead Metals, Inc.
303 W. 10th St.
New York 14, N. Y.

MOTORS (Electric)

Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago, Ill.

MULLERS—See SAND PREPARATION EQUIPMENT

NAILS (Foundry)

Standard Horse Nail Corp.
New Brighton, Pa.

NAILS (Wire)

Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.

NICKEL

Alloy Metal Products, Inc.
Rockingham Rd.
Davenport, Iowa.
International Nickel Co., Inc.
67 Wall St.
New York 5, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 6, N. Y.

NITROGEN—See GAS

NOZZLES (Blasting, Spray)

Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.
Carborundum Co.
Perth Amboy, N. J.
Carpenter Brothers, Inc.
606 West Wisconsin Ave.
Milwaukee 3, Wis.
Norton Co.
Worcester 6, Mass.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
Spraying Systems Co.
Bellwood, Ill.
Wheelabrator Corp.
505 S. Byrkit St.
Mishawaka, Ind.

OIL, LINSEED—See BINDERS

OVENS (Annealing and Heat Treating)—See FURNACES

OVENS (Core and Mold)

Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio.
Foundry Equipment Co.
1831 Columbus Rd.
Cleveland 13, Ohio.
Kirk & Blum Mfg. Co.
3108 Forrer St.
Cincinnati 9, Ohio.
George Koch Sons, Inc.
10 South 11th St.
Evansville 12, Ind.
Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio.
J. O. Ross Engineering Corp.
444 Madison Ave.
New York 17, N. Y.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway
Detroit 16, Mich.

OVENS (Enameling, Japanning)

Carl Mayer Corp.
20800 Center Ridge Rd.
Cleveland 16, Ohio.
Foundry Equipment Co.
1831 Columbus Rd.
Cleveland 13, Ohio.
Kirk & Blum Mfg. Co.
3108 Forrer St.
Cincinnati 9, Ohio.
George Koch Sons, Inc.
10 South 11th St.
Evansville 12, Ind.
Lanly Co.
2800 Euclid Ave.
Cleveland 15, Ohio.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard
Chicago 12, Ill.

OXYGEN—See GAS

PAINT (Corrosion and Heat Resistant)

Speco, Inc.
7308 Associate Ave.
Cleveland, Ohio.

PARTING COMPOUNDS

Acheson Colloids Co.
Port Huron, Mich.
Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.
The Borden Company
350 Madison Ave.
New York 17, N. Y.
Delta Oil Products Co.
6263 Cedarburg Rd.
Milwaukee 9, Wis.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
E. F. Houghton Co.
303 W. Lehigh Ave.
Philadelphia 33, Pa.
Silicones Division
Union Carbide Corp.
40 E. 42nd St.
New York 17, N. Y.
Smith Oil & Refining Co.
1102 Kilburn Ave.
Rockford, Ill.
Frederic B. Stevens, Inc.
18th & Vernor Highway
Detroit 16, Mich.
Tamms Industries Co.
228 N. LaSalle St.
Chicago 1, Ill.
Thiem Products Co.
9800 W. Rogers
Milwaukee 14, Wis.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.
Witco Chemical Co.
75 East Wacker Drive
Chicago 1, Ill.

PASTE (Core)

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
The Borden Company
350 Madison Ave.
New York 17, N. Y.
Corn Products Refining Co.
17 Battery Pl.
New York 4, N. Y.
Delta Oil Products Co.
6263 Cedarburg Rd.
Milwaukee 9, Wis.
Eastern Clay Products, Dept.
International Minerals & Chemical Corp.
20 N. Wacker Dr.
Chicago 6, Ill.
Foundry Services, Inc.
1045 South High St.
Columbus 6, Ohio.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway
Detroit 16, Mich.
Thiem Products Co.
9800 W. Rogers
Milwaukee 14, Wis.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

PATTERN COATINGS

Acheson Colloids Co.
Port Huron, Mich.
Foundry Rubber Inc.
5200 River Road
Washington 16, D. C.
National Chemical & Plastics Co.
1424 Philpot St.
Baltimore 31, Md.

PATTERN COMPOUND

Acheson Colloids Co.
Port Huron, Mich.
Devcon Co.
Danvers, Mass.
Tamms Industries Co.
228 N. LaSalle St.
Chicago 1, Ill.
United States Gypsum Co.
300 West Adams
Chicago 6, Ill.

PATTERN DRAW MACHINES—See STRIPPING and DRAWING MACHINES

PATTERN LETTERS

H. P. Maughlin Co.
953 Ingleside Ave.
Columbus 8, Ohio.

PATTERN METAL

Federated Metals Division of American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.

PATTERN SHOP EQUIPMENT

Oliver Machinery Company
Grand Rapids 1, Mich.
Tamms Industries Co.
228 N. LaSalle St.
Chicago 1, Ill.

PATTERNS and PATTERN PLATES (Wood, Metal, Plastic)

Accurate Match Plate Co.
1847 W. Carroll St.
Chicago, Ill.
Champion Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Hines Flask Co.
3431 W. 140th St.
Cleveland 11, Ohio.
Midwest Pressure Casting Co.
1350 West Cermak Road
Chicago, Ill.
Moltrup Steel Products Co.
Beaver Falls, Pa.
Scientific Cast Products Corp.
1388-92 E. 40th St.
Cleveland 3, Ohio.
Shell Process Inc.
Bliss & Parkside St.
West Springfield, Mass.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

PHOSPHOR COPPER

Federated Metals Division of American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.

PHOTOGRAPHIC EQUIPMENT

Eastman Kodak Co.
Rochester, N. Y.

PINS (Flask)—See FLASK FITTINGS, PINS and BUSHINGS

PITCH—See COREBINDERS (Pitch)

PLATES, CORE (Aluminum, Asbestos, Magnesium, Steel)

American Foundry Flask Co.
2745 Southwest Blvd.
Kansas City, Mo.
Johns-Manville
22 E. 40th St.
New York 16, N. Y.
Moltrup Steel Products Co.
Beaver Falls, Pa.
Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.
Sterling National Industries, Inc.
7036 W. Walker St.
Milwaukee 14, Wis.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

PLUMBAGO—See GRAPHITE and GRAPHITE BRIQUETS

PNEUMATIC TOOLS

Airetool Mfg. Co.
Springfield, Ohio.
Chambersburg Engineering Co.
Chambersburg, Pa.
Chicago Mfg. & Distributing Co.
1928 W. 46th St.
Chicago 9, Ill.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Combined Supply & Equipment Co., Inc.
215 Chandler St.
Buffalo 7, N. Y.
Dayton Pneumatic Tool Co.
Dayton 1, Ohio.
Gardner-Denver Co.
Quincy, Ill.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.
Joy Mfg. Co.
Henry W. Oliver Bldg.
Pittsburgh 22, Pa.
Master Pneumatic Tool Co., Inc.
13 Krick Rd.
Bedford, Ohio.

POTS (Melting)

Acme Foundry Co.
2503 22nd St.
Detroit 16, Mich.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.

POURING DEVICES

Bartlett & Snow, C. O., Co.
(Grindle Division)
6201 Harvard Ave.
Cleveland 5, Ohio.
Cleveland Tramrail Div.
Cleveland Crane & Engineering Co.
Wickliffe, Ohio.
Hawley Mfg. Co.
411 North Wabash
Wabash, Indiana
Industrial Equipment Co.
Minster, Ohio.
Modern Equipment Co.
Port Washington, Wis.
Whiting Corp.
15607 Lathrop Ave.
Harvey, Ill.

PRESSES (Casting Straightening)

Chambersburg Engineering Co.
Chambersburg, Pa.

PRESSURE RECORDERS

Foxboro Company
Foxboro, Mass.

PULLEYS (Belt, Selfcleaning)
Van Gorp Mfg. Co., Inc.
Box 123
Pella, Iowa.

PULLEYS (Magnetic)—See SEPARATORS (Magnetic)

PUMPS (Liquid)
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Gardner-Denver Co.
Quincy, Ill.
Gray Company, Inc.
60 11th Ave., Northeast
Minneapolis 13, Minn.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.

PUMPS (Vacuum)
Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Fuller Company
Catasauqua, Pa.
Ingersoll-Rand Co.
11 Broadway
New York 4, N. Y.

PUSH-OFF MACHINES—See STRIPPING, DRAWING and ROLLOVER MACHINES

PUTTY (Foundry)
Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.

PYROMETERS
Foxboro Company
Foxboro, Mass.
Gordon, Claud S., Co.
3000 S. Wallace
Chicago 16, Ill.
Illinois Testing Laboratories, Inc.
418 N. LaSalle St.
Chicago 10, Ill.
Leeds & Northrup
4901 Stenton Ave.
Philadelphia 44, Pa.
Marshall Co., L. H.
270 W. Lane
Columbus 2, Ohio.
Minneapolis-Honeywell Co.
Wayne and Windrim Avenues
Philadelphia 44, Pa.
Pyrometer Instrument Co.
Bergenfield, N. J.
Tamms Industries Co.
228 N. LaSalle St.
Chicago 1, Ill.

RACKS (Core Oven)
Chicago Mfg. & Distributing Co.
1928 W. 46th St.
Chicago 9, Ill.
Foundry Equipment Co.
1831 Columbus Rd.
Cleveland 13, Ohio.
Kirk & Blum Mfg. Co.
3108 Forrer St.
Cincinnati 9, Ohio.

RADIOGRAPHIC EQUIPMENT
Budd Co.
Nuclear Systems Div.
2950 Roberts Ave.
Philadelphia 29, Pa.
Eastman Kodak Co.
Rochester, N. Y.
Picker X-Ray Corp.
25 S. Broadway
White Plains 10, N. Y.
Westinghouse Electric Corp.
2519 Wilkens Ave.
Baltimore 3, Md.

REFRACTORIES (Firebrick, Fire Clay, Fire Sand, Fire Stone)
Ajax Electrothermic Corp.
Ajax Park
Trenton, N. J.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Babcock & Wilcox Co.
161 42nd St.
New York 17, N. Y.
Campbell-Hausfeld Co.
Harrison, Ohio.
Carborundum Co.
Niagara Falls, N. Y.
Carborundum Co.
Perth Amboy, N. J.
Carpenter Brothers, Inc.
606 West Wisconsin Ave.
Milwaukee 3, Wis.
Cement Gun Co.
1520 Walnut St.
Allentown, Pa.
Denver Fire Clay Co.
2301 Blake St.
Denver 2, Colo.
Eastern Clay Products Dept.
International Minerals & Chemical Corp.
20 N. Wacker Drive
Chicago 6, Ill.
Great Lakes Carbon Co.
18 E. 48th St.
New York 17, N. Y.
A. P. Green Fire Brick Co.
Mexico, Mo.
Harbison-Walker Refractories Co.
307 Fifth Ave.
Pittsburgh 22, Pa.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Illinois Clay Products Co.
Joliet, Ill.
Inductotherm Corp.
412 Illinois Ave.
Delanco, N. J.
Ironton Fire Brick Co.
Ironton, Ohio.
Johns-Manville
22 E. 40th St.
New York 16, N. Y.
Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard
Chicago 12, Ill.
National Carbon Co.
Div. Union Carbide Corp.
30 E. 42nd St.
New York 17, N. Y.
North American Refractories Co.
National City Bank Bldg.
Cleveland 14, Ohio.
Norton Co.
Worcester 6, Mass.
H. K. Porter Co.
Refractories Div.
Porter Bldg.
Pittsburgh 19, Pa.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway
Detroit 16, Mich.
Chas. Taylor Sons Co.
710 Burns St.
Cincinnati 4, Ohio.
United States Graphite Co.
Saginaw, Mich.
Walsh Refractories
101 Ferry St.
St. Louis 7, Mo.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

REFRACTORY GUNS
Blastcrete Equipment Co.
323 East 58th St.
Los Angeles 11, Calif.
Cement Gun Co.
1520 Walnut St.
Allentown, Pa.
Eastern Clay Products Dept.
International Minerals & Chemicals Corp.
20 N. Wacker Drive
Chicago 6, Ill.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Ridley & Company, Inc.
11275 Massachusetts Ave.
West Los Angeles 25, Calif.

RELEASE AGENTS
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
The Borden Company
350 Madison Ave.
New York 17, N. Y.
Foundry Services Inc.
1045 S. High St.
Columbus 6, Ohio.
Silicones Division
Union Carbide Corp.
30 East 42nd St.
New York 17, N. Y.
Witco Chemical Co.
75 East Wacker Drive
Chicago 1, Ill.

RESIN—See BINDERS

RESPIRATORS
American Optical Co.
Southbridge, Mass.
Pangborn Corporation
1400 Pangborn Blvd.
Hagerstown, Md.

RIDDLES (Hand)
Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.
Great Western Mfg. Co.
Leavenworth, Kans.
Frederic B. Stevens, Inc.
18th St. & Vernor Highway
Detroit 16, Mich.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

RIDDLES (Power)
Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Champion Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Foundry Supplies & Mfg. Co.
2221 Orchard St.
Chicago 14, Ill.
Great Western Mfg. Co.
Leavenworth, Kans.
States Engineering Corp.
243 East Murray St.
Ft. Wayne, Indiana.

RISER COMPOUND—See EXOTHERMIC COMPOUNDS

ROLLOVER MACHINES—See STRIPPING, DRAWING AND ROLLOVER MACHINES

ROPE (Wire)
American Chain & Cable Co., Inc.
271 S. Pennsylvania Ave.
Wilkes-Barre, Pa.

SAFETY EQUIPMENT
American Optical Co.
Southbridge, Mass.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
United States Rubber Co.
1230 Ave. of the Americas
New York 20, N. Y.

SAND (Core, Molding, Blasting)
Harbison-Walker Refractories Co.
307 Fifth Ave.
Pittsburgh 22, Pa.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Orefraction Inc.
7425 Thomas St.
Pittsburgh 8, Pa.
Ottawa Silica Co.
Ottawa, Ill.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
Pennsylvania Glass Sand Corp.
140 Stanwix St.
Pittsburgh 22, Pa.
Standard Silica Co.
Ottawa, Ill.
Wedron Silica Co.
135 S. LaSalle St.
Chicago 3, Ill.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

SAND (Zircon)
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Berkshire Chemicals, Inc.
630 Third Ave.
New York 17, N. Y.
Orefraction Inc.
7425 Thomas St.
Pittsburgh 8, Pa.

SAND ADDITIVES
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Delta Oil Products Co.
6263 Cedarburg Rd.
Milwaukee 9, Wis.
Eastern Clay Products Div.
International Minerals & Chemical Corp.
20 N. Wacker Dr.
Chicago 6, Ill.
Hickman-Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Michael Wood Products Co.
Midland Ave.
Garfield, New Jersey
Ti-Co Industries, Inc.
P. O. Box 185
Tipton, Ind.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

SAND BLAST EQUIPMENT—See BLAST CLEANING EQUIPMENT

SAND BLAST NOZZLES—See NOZZLES (Blasting)

SAND CONTROL and TESTING EQUIPMENT
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Carpenter Brothers, Inc.
606 West Wisconsin Ave.
Milwaukee 3, Wis.
Dietert, Harry W., Co.
9330A Roselawn Ave.
Detroit 4, Mich.
Gordon, Claud S., Co.
3000 S. Wallace
Chicago 16, Ill.
Great Western Mfg. Co.
Leavenworth, Kans.
Hartley Controls Corp.
P.O. Box 290
Neenah, Wis.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.

SAND PREPARATION EQUIPMENT
Ajax Flexible Coupling Co. Inc.
Westfield, N. Y.
Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
American Air Filter Co.
226 Central Ave.
Louisville 8, Ky.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Baker Perkins, Inc.
Saginaw, Mich.
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
C & S Products Co.
18656 Fitzpatrick Ave.
Detroit 28, Mich.
Carrier Conveyor Corp.
211 N. Jackson St.
Louisville 2, Ky.
Carver Foundry Products Co.
1056 Hershey Ave.
Muscatine, Iowa.
Chain Belt Co.
Milwaukee 1, Wis.
Champion Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Clearfield Machine Co.
Clearfield, Pa.
Cleveland Tramrail Div.
Cleveland Crane & Engineering Co.
Wickliffe, Ohio.
Deister Concentrator Co.
901 Glasgow Ave.
Ft. Wayne, Ind.
Dietert, Harry W., Co.
9330A Roselawn Ave.
Detroit 4, Mich.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Foundry Supplies & Mfg. Co.
2221 Orchard St.
Chicago 14, Ill.
Gilson Manufacturing Co.
Oostburg, Wis.
Goodrich, B. F., Co.
Akron 18, Ohio.
Great Western Mfg. Co.
Leavenworth, Kans.
Hartley Controls Corp.
P.O. Box 290
Neenah, Wis.
International Automation Corp.
Ann Arbor, Mich.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Newaygo Engineering Co.
Newaygo, Mich.

Osborn Mfg. Co.
5401 Hamilton Ave.
Cleveland 14, Ohio.
Pekay Machine & Engineering Co.
865 N. Sangamon St.
Chicago 22, Ill.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Royer Foundry & Machine Co.
Kingston, Pa.
States Engineering Corp.
243 East Murray St.
Ft. Wayne 2, Ind.
Webster Mfg. Co.
Tiffin, Ohio.
Westover Corp.
Nomad Equipment Div.
3110 W. Fond du Lac Ave.
Milwaukee 10, Wis.
Wheelabrator Corp.
505 S. Byrkit St.
Mishawaka, Ind.

SAND RAMMERS

Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Chicago Mfg. & Distributing Co.
1928 W. 46th St.
Chicago 9, Ill.
Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Dayton Pneumatic Tool Co.
Dayton 1, Ohio.
Gardner-Denver Co.
Gardner Drive
Quincy, Ill.
Ingersoll Rand Co.
11 Broadway
New York 4, N. Y.
Master Pneumatic Tool Co., Inc.
13 Krick Rd.
Bedford, Ohio.

SAND RAMMING MACHINES (Slinger Type)

Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
F. E. (North America) Ltd.
47 Advance Rd.
Toronto 18, Ontario, Canada.

SAND RECLAIMING EQUIPMENT

Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Carver Foundry Products Co.
1056 Hershey Ave.
Muscatine, Iowa.
Deister Concentrator Co.
901 Glasgow Ave.
Ft. Wayne, Ind.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Nichols Engineering & Research Corp.
70 Pine St.
New York 5, N. Y.
Stearns Magnetic Products Div.
Indiana Steel Products Co.
635 South 28th St.
Milwaukee 46, Wis.

SAND SIFTING and SCREENING MACHINERY—See SAND PREPARATION EQUIPMENT

SAND STABILIZER

Archer-Daniels-Midland Co.
Federal Foundry Supply Division
2191 W. 110th St.
Cleveland 2, Ohio.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
Reichhold Chemicals, Inc.
525 N. Broadway
White Plains, N. Y.

SANDING MACHINERY (Disc, Spindle, Belt, etc.)

Grinding & Polishing Machinery Corp.
2530 Winthrop Ave.
Indianapolis 5, Ind.
Oliver Machinery Company
Grand Rapids 1, Mich.
Skil Corp.
5033 North Elston
Chicago 30, Ill.

SAWS (Band, Metal, Wood and Saw Accessories)

Chicago Pneumatic Tool Co.
6 E. 44th St.
New York 17, N. Y.
Industrial Saw Mfg. Co.
304-8 East Oaks Ave.
Compton 4, Calif.
Oliver Machinery Co.
Grand Rapids 1, Mich.

SCREENS (Shakeout and Vibrating)

Ajax Flexible Coupling Co., Inc.
Westfield, N. Y.
Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Carrier Conveyor Corp.
211 N. Jackson St.
Louisville 2, Ky.
Deister Concentrator Co.
901 Glasgow Ave.
Ft. Wayne, Ind.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Great Western Mfg. Co.
Leavenworth, Kans.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.

SEA COAL

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Penn-Rilton Co.
324 W. 23rd St.
New York 11, N. Y.
Stevens, Frederic B., Inc.
18th & Vernor Highway
Detroit 16, Mich.
Thiem Products Co.
9800 W. Rogers
Milwaukee 14, Wis.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

SEALING COMPOUND (Mold)

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Presstite Keystone Engineering Products Co.
Div. of American-Marietta Co.
39th & Choteau
St. Louis 10, Mo.
Whitehead Bros. Co.
324 W. 23rd St.
New York 11, N. Y.

SEPARATORS (Compressed Air Contaminant)—See FILTERS and SEPARATORS

SEPARATORS (Magnetic)

Ajax Flexible Coupling Co. Inc.
Westfield, N. Y.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
National Engineering Co.
549 W. Washington St.
Chicago 6, Ill.
Stearns Magnetic Products Div.
Indiana Steel Products Co.
635 South 28th St.
Milwaukee 46, Wis.

SHAKEOUT MACHINERY

Allis-Chalmers Mfg. Co.
1123 S. 70th St.
Milwaukee 14, Wis.
American Air Filter Co.
226 Central Ave.
Louisville 8, Ky.
Bartlett & Snow, C. O., Co.
6201 Harvard Ave.
Cleveland 5, Ohio.
Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.
The Branford Co.
132 Glen St.
New Britain, Conn.
F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada
Jeffrey Mfg. Co.
907 N. Fourth St.
Columbus 16, Ohio.
Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.
Planet Corp.
1820 Sunset
Lansing 6, Mich.
Royer Foundry & Machine Co.
Kingston, Pa.
Simplicity Engineering Co.
Durand, Mich.
Webster Mfg. Co.
Tiffin, Ohio.

SHELVING (Prefabricated Steel)

Republic Steel Corp.
Republic Bldg.
Cleveland 1, Ohio.

SHOT and GRIT

Abrasive Shot and Grit Co.
Springville, N. Y.
Alloy Metal Abrasive Co.
121 S. Division St.
Ann Arbor, Mich.
Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Carborundum Co.
Niagara Falls, N. Y.
Carpenter Brothers, Inc.
606 West Wisconsin Ave.
Milwaukee 3, Wis.
Cleveland Metal Abrasive Co.
887 E. 67th St.
Cleveland, Ohio.
Durasteel Abrasive Co.
26th & Smaliman Sts.
Pittsburgh 22, Pa.
Globe Steel Abrasive Co.
Mansfield, Ohio.
Hickman Williams & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Macklin Co.
Jackson, Mich.
Metal Blast, Inc.
871 E. 67th St.
Cleveland, Ohio.
National Metal Abrasive Co.
3560 Norton Ave.
Cleveland 7, Ohio.
Norton Co.
Worcester 6, Mass.
Pangborn Corp.
1400 Pangborn Blvd.
Hagerstown, Md.
Simonds Abrasive Co.
Tacony & Fraley Sts.
Philadelphia 37, Pa.
Wheelabrator Corp.
505 S. Byrkit St.
Mishawaka, Ind.

SHOT TESTING MACHINES

Alloy Metal Abrasive Company
Ann Arbor, Mich.

SHOVELS

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Stevens, Frederic B., Inc.
18th St. & Vernor Highway
Detroit 16, Mich.

SHOVELS (Power)

Hough, Frank G., Co.
703 Sunnyside Ave.
Libertyville, Ill.

SILICOMANGANESE

H. K. Bennett & Co.
342 Madison Ave.
New York 17, N. Y.
Pickands, Mather & Co.
Union Commerce Bldg.
Cleveland 14, Ohio.
Union Carbide Metals Co.
Div. Union Carbide Corp.
30 East 42nd St.
New York 17, N. Y.
Vanadium Corp. of America.
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

SILICON (Briquets)

Ohio Ferro Alloys Corp.
Canton 9, Ohio.
Union Carbide Metals Co.
Div. Union Carbide Corp.
535 Fifth Ave.
New York 17, N. Y.
Vanadium Corp. of America
420 Lexington Ave.
New York, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

SILICON CARBIDE (Briquets)

American Metallurgical Products Co.
3600 Forbes St.
Pittsburgh 13, Pa.
Ohio Ferro Alloys Corp.
Canton 9, Ohio.

SILOS

Marietta Concrete Corp.
Marietta, Ohio.

SKIMMERS

Chicago Mfg. & Distributing Co.
1928 W. 46th St.
Chicago 9, Ill.
Tamms Industries Co.
228 N. LaSalle St.
Chicago 1, Ill.

SLINGS (Chain)—See CHAIN

SMELTERS and REFINERS

Federated Metals Div., American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.

SNAGGING MACHINES—See GRINDERS

SNAGGING WHEELS—See GRINDING WHEELS

SODA ASH

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
Diamond Alkali Co.
300 Union Commerce Bldg.
Cleveland 14, Ohio.
Hercules Powder Co.
Wilmington 99, Del.
Olin Mathieson Chemical Corp.
400 Park Ave.
New York, N. Y.

SODIUM SILICATE—See BINDERS SOLDER

Federated Metals Div., American Smelting and Refining Co.
120 Broadway
New York 5, N. Y.
Whitehead Metals Inc.
303 W. 10th St.
New York 14, N. Y.

SPECTROGRAPHIC ANALYSIS (Equipment and Materials)

Baird-Atomic, Inc.
33 University Rd.
Cambridge 38, Mass.
Spectrochemical Laboratories, Inc.
8350 Frankstown Ave.
Pittsburgh 20, Pa.

SPEED REDUCERS

Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.

SPRAY GUNS

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.
The Branford Co.
130 Chestnut St.
New Haven 7, Conn.
Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.
James A. Murphy & Co.
Hamilton, Ohio.

SPRUE CUTTERS

Adams Co.
Dubuque, Iowa.

Beardsley & Piper
Pettibone-Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.

Milwaukee Chaplet & Mfg. Co.
1023 S. 40th St.
Milwaukee, Wis.

STEEL (Structural)

American Bridge Div.
United States Steel Corp.
52 S. Wm. Penn Pl.
Pittsburgh 19, Pa.

STRAIGHTENERS and CUTTERS (Core Rod)

Beardsley & Piper
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.

Wheelabrator Corp.
505 S. Byrkit St.
Mishawaka, Ind.

STRAINER CORES—See CORES (Strainer, Riser, Breakoff)

STRIPPING, DRAWING and ROLLOVER MACHINES

The Adams Co.
Dubuque, Iowa.

Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.

Champion Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
Chicago 39, Ill.

F. E. (North America) Ltd.
47 Advance Road
Toronto 18, Canada

Greenlee Bros. & Co.
2136 Twelfth St.
Rockford, Ill.

International Molding Machine Co.
LaGrange Park, Ill.

Tabor Mfg. Co.
Div. Turbo Machine Co.
Lansdale, Pa.

SUPPLY HOUSES (Foundry)

Archer-Daniels-Midland Co.
Federal Foundry Supply Div.
2191 W. 110th St.
Cleveland 2, Ohio.

Baroid Chemicals Inc.
Sub. National Lead Co.
P.O. Box 1675
Houston 2, Texas.

Combined Supply & Equipment Co. Inc.
215 Chandler St.
Buffalo 7, N. Y.

Eastern Clay Products, Dept.
International Minerals & Chemical Corp.
20 N. Wacker Dr.
Chicago 6, Ill.

Foundry Services, Inc.
1045 S. High St.
Columbus 6, Ohio.

Stevens, Inc., Frederic B.
18th & Vernor Highway
Detroit 16, Mich.

Thiem Products Co.
9800 W. Rogers
Milwaukee 14, Wis.

TABLES

Link-Belt Co.
Dept. 1058-FWTB
Prudential Plaza
Chicago 1, Ill.

TELLURIUM

American Smelting & Refining Co.
120 Broadway
New York 5, N. Y.

TEMPERATURE CONTROL and RECORDING EQUIPMENT

Gordon, Claude S., Co.
3000 S. Wallace
Chicago 16, Ill.

Foxboro Co.
Foxboro, Mass.

Illinois Testing Laboratories, Inc.
418 N. LaSalle St.
Chicago 10, Ill.

Leeds & Northrup
4901 Stenton Ave.
Philadelphia 44, Pa.

Lindberg Engineering Co.
Fisher Furnace Div.
2450 W. Hubbard
Chicago 12, Ill.

Marshall Co., L. H.
270 W. Lane
Columbus 2, Ohio.

Minneapolis-Honeywell Co.
Wayne and Windrim Aves.
Philadelphia 44, Pa.

TENSILE TESTING MACHINES

Detroit Testing Machine Co.
9390 Grinnell Ave.
Detroit 13, Mich.

Dietert, Harry W., Co.
9330A Roselawn Ave.
Detroit 4, Mich.

TESTING EQUIPMENT—See Type of Test

THERMOCOUPLES

Gordon, Claude S., Co.
3000 S. Wallace
Chicago 16, Ill.

Illinois Testing Laboratories, Inc.
418 N. LaSalle St.
Chicago 10, Ill.

Leeds & Northrup
4901 Stenton Ave.
Philadelphia 44, Pa.

Marshall Co., L. H.
270 W. Lane
Columbus 2, Ohio.

Minneapolis-Honeywell Regulator Co.
Wayne and Windrim Aves.
Philadelphia 44, Pa.

Pyrometer Instrument Co.
Bergenfield, N. J.

Tamms Industries Co.
228 N. LaSalle St.
Chicago 1, Ill.

TILE (Gate)

Louthan Corp.
East Liverpool, Ohio.

TIMERS (Electric)

Beardsley & Piper Div.
Pettibone Mulliken Corp.
2424 N. Cicero Ave.
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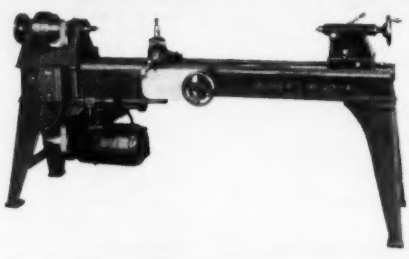
Also represented in principal industrial centers, including Pittsburgh, Pa., Cleveland and Cincinnati, Ohio.

Circle 763 on Page 53

16 Spindle Speeds

The "OLIVER" No. 20
PATTERN MAKERS' LATHE



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Circle 764 on Page 53

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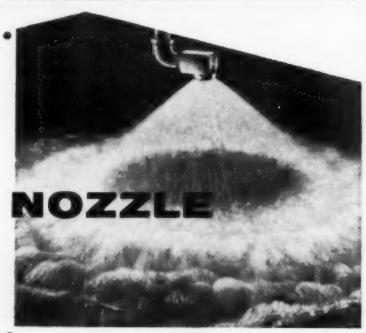
problem?



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And . . . for complete spray nozzle information, write for Catalog 24.

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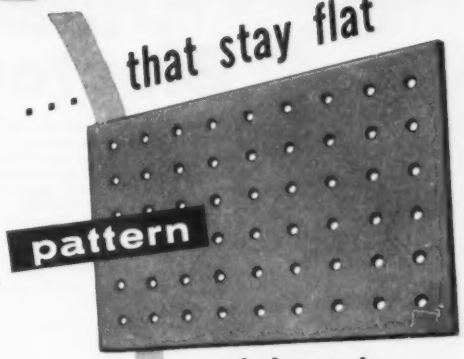
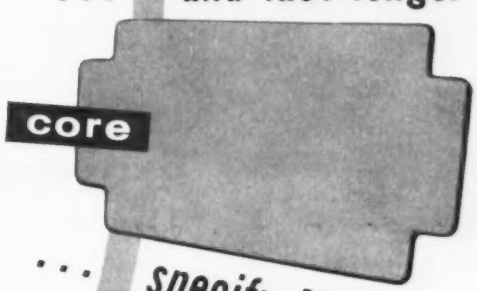
Circle 767 on Page 53

for **plates**

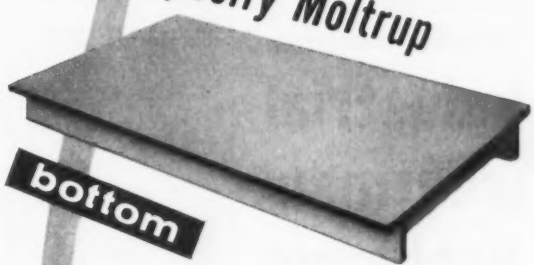
... that stay flat



... and last longer



... specify Moltrup



For accurate casting results specify Moltrup Plates. They are long-lasting and stay flat—because Moltrup employs a special flattening process designed to permanently eliminate buckling or bending. Consequently your investment goes further and your profit margin increases. Plates are made to your specifications. Write or phone us for complete information.

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F-2

Circle 768 on Page 53

A NEAT TRICK...

ELIMINATE BRICK

we guarantee it with the

Blastcrete Gun

MODEL PM-1

MODEL BG-8-A

Hundreds of foundries all over the country . . . from the smallest to the largest . . . have eliminated the use of block and brick. This is accomplished by using a BLASTCRETE gun which shoots denser linings, faster (usually ⅓ the time of other type guns). The Blastcrete gun's ability to handle extremely damp materials (such as rebounds) is only one of its many outstanding features. So superior is the BLASTCRETE GUN that more and more companies have discarded the gun formerly used after a FREE trial run with this outstanding refractory gun in their own cupolas.

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A BLASTCRETE gun will be installed FREE in your plant on a NO OBLIGATION basis. Simply compare it with your present method or gun. Afterwards decide for yourself! Buy it or rent it . . . either way you'll want a BLASTCRETE!

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Developed for use in small cupolas, ladles, electric and reverberatory furnaces, is adaptable to any air placement gun (fits any size hose) and is available at the extremely low cost of

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SEND FOR NAME OF NEAREST DEALER

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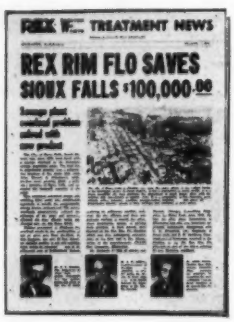
Find out how others are solving

Industrial Treatment Problems



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You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

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Manufacturers of Pneumatic Tools Since 1903

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Circle 770 on Page 53

Circle 771 on Page 53

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AUTOMOBILE CYLINDER LINERS

DIESEL ENGINE LINERS

BRONZE BUSHINGS

on the new
WATER-COOLED
Model M-WC
(Illustrated)

Utilizes low cost permanent molds of available steel tubing to produce gray machinable cast iron or bronze bushings. Water cooled molds can be maintained at either high or low temperature easily. High or limited production in very small space with unskilled labor. Completely safe for workmen. Simple, sturdy equipment. Quick changeover from one mold to another. Practically 100% metal yield of high quality, denser castings. Metal porosity eliminated.

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We have available an Experimental Foundry equipped for ferrous and non-ferrous melting for both vertical and horizontal centrifugal casting production. Our facilities are available to foundries for research or trial centrifugal castings at low cost.

Centrifugal Casting Machine Co.

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Circle 772 on Page 53

STRAIGHTEN, SIZE, COIN

WARPED MALLEABLE IRON CASTINGS

in one operation on the

CECOSTAMP

- **Save in manufacturing costs**
- **Restrike to close tolerances**
- **Reduce number of rejects**
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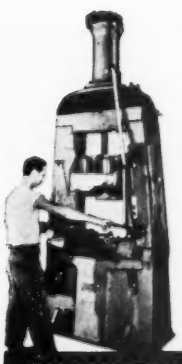

The Cecostamp's impact blow not only straightens, but can also coin to close tolerances • 100% restrike in the Cecostamp makes it unnecessary to inspect and size castings manually, piece by piece • No longer is it necessary to laboriously stack castings in annealing baskets to minimize distortion • In many cases, close tolerance restrike reduces casting weight and minimizes machining operations • The Cecostamp is an air-powered Drop Stamp; rapid, safe, easily operated • Dies are simple, inexpensive • Applications often displace larger, more expensive presses • Write for complete details.

CHAMBERSBURG ENGINEERING CO.

CHAMBERSBURG, PA.

Circle 773 on Page 53

Over 1900 pourings per ladle lining with MOROC® BINDER

Diamond Moroc Binder has extended lining life in actual foundry use . . . and cost of materials and labor have been reduced by as much as 75%.

With Moroc in the lining mix, you don't get skull formations or slag adhesion. Erosion and washout are minimized.

Moroc is *fast*, too. Within five hours, you can ram, cure and get ladles back into service. It's even quicker when flame curing is used.

If *you* aren't satisfied with the mileage you're getting from your linings, investigate Moroc Binder. Write for complete information. Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals

Circle 774 on Page 53

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A royal proclamation by

ENGINEERED TOUGHNESS

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"KING OF THE ARC"

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presenting:

SIX ELECTRODES
TO COVER 95% OR MORE OF
YOUR BUILDUP AND HARD-FACING REQUIREMENTS

EACH IN FOUR SIZES

Contact your nearest distributor, or the factory direct, for free 20-page manual

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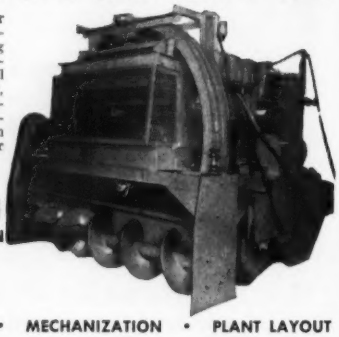
MANUFACTURED BY
The SIGHT FEED GENERATOR COMPANY

WEST ALEXANDRIA, OHIO, U.S.A.

Circle 775 on Page 53

LESS FACING SAND REQUIRED
WHEN A RINGLIFT SAND CONDITIONER IS USED!

Sand is so clean that far less facing sand is required in foundries using a Ringlift Sand Conditioner. It picks up all sand, screens, cools, mixes and wets it, removes scrap iron, deposits sand on floor in neat windrows. Send for literature.



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Circle 779 on Page 53

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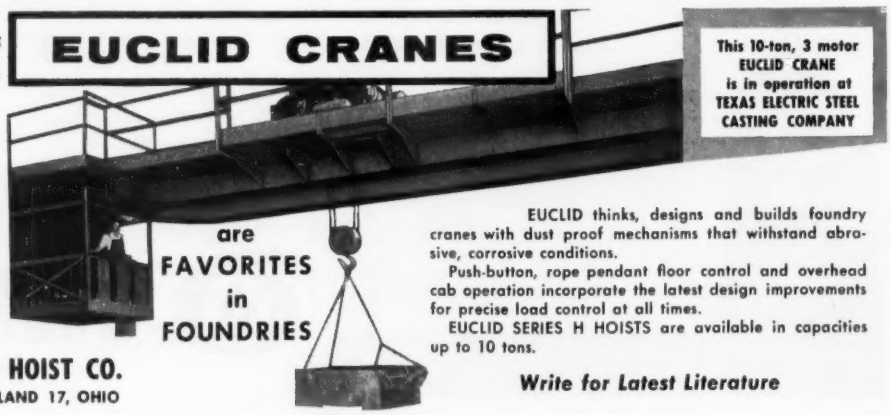
Larson Foundry
Alcoa Foundry
Interlake Iron Corp.
Texas Electric Steel Casting Co.

EUCLID CRANES



This 10-ton, 3 motor EUCLID CRANE is in operation at TEXAS ELECTRIC STEEL CASTING COMPANY

are FAVORITES in FOUNDRIES

EUCLID thinks, designs and builds foundry cranes with dust proof mechanisms that withstand abrasive, corrosive conditions.

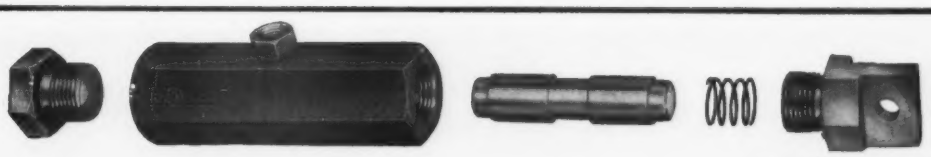
Push-button, rope pendant floor control and overhead cab operation incorporate the latest design improvements for precise load control at all times.

EUCLID SERIES H HOISTS are available in capacities up to 10 tons.

Write for Latest Literature

THE EUCLID CRANE & HOIST CO.
1360 CHARDON ROAD • CLEVELAND 17, OHIO

Circle 780 on Page 53



3 steel alloys*

Give Branford vibrators longer life

Strength and durability are built in . . . preserved . . . through specific steel alloys that give each part of each Branford Vibrator the properties it needs for a long serviceable life.

Branford Pistons are built from hard, chrome-coated steel, especially wear resistant to maintain efficient precision over long periods of use.

Springs made from high tensile, flexible steel flex themselves millions of times without fracture . . . without fatigue.

Branford body steel is rugged, tough, ready to take the torture and stress of vibration without breaks, cracks, and without frictional wear.

When you specify "Branford Vibrators" you receive unmatched performance, longer service, less down time.

Write for your Branford catalog and the name of your local Branford distributor.

*** Branford Vibrators are built in every size—and in every size they are built from steel throughout (including the bodies).**

THE BRANFORD COMPANY 130 CHESTNUT STREET — NEW HAVEN, CONNECTICUT

Circle 781 on Page 53

COB GRITS

For Airless Blast Cleaning & Metal Finishing—Also COB FLOUR—U. S. STD SCREEN ANALYSIS: 40-200.

TI-CO INDUSTRIES, INC. P.O. BOX 185 TIPTON, INDIANA
Phone or Telegraph:
FEderal 2-5942 Elwood, Ind.

Circle 782 on Page 53

NCP makes effective PATTERN LACQUERS

1. Seals pattern to prevent moisture and water absorption.
2. Brushes easily—dries quickly.
3. Does not chip, peel, bubble, or blister, and is flexible.
4. Adds slip, promoting clean parting of pattern from sand.
5. Made in all colors.
6. Time tested material—successfully used in pattern shops all over the country for over 30 years.

The National Chemical & Plastics Co.
1424 Philpot Street Baltimore 31, Maryland

Circle 783 on Page 53

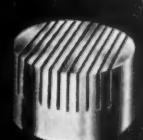
EMPIRE*

"THAT GOOD" FOUNDRY COKE

DEBARDELEBEN COAL CORPORATION
2201 First Ave., North • Birmingham 3, Ala.
Phone: ALpine 1-9135
**Reg. U.S. Pat. Off*

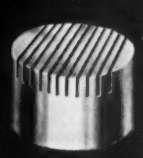
Circle 784 on Page 53

SLOTTED CORE BOX VENTS



X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



DEEP HEAD .093 Wide or Narrow Slots .014 .010

CO_2 TYPE DEEP HEAD .093 Wide or Narrow .014 Slots .010

Manufactured by **C.M. SMILLIE & CO.** 1124 WOODWARD HGTS., FERNDALE 20, MICH

INSERTING DRILL

- MOST ECONOMICAL METHOD for INSERTING CORE VENTS
- CORRECT DEPTH
- UNIFORMITY OF HOLES
- FASTER INSERTION OF VENT

VENT CLEANER
- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

Circle 785 on Page 53

CLASSIFIED ADVERTISING

Help Wanted

FOUNDRY DESIGNERS AND DRAFTSMEN

Large manufacturer with a number of gray, nodular, and malleable iron foundries in the Middle West has openings in its central engineering department for draftsmen and designers with experience in the design of foundry facilities, including sand processing and handling systems, molding equipment, cupolas, and other allied equipment and installations. Give detailed resume of experience, age, education, salary requirements, date available, and a recent picture in first letter.

BOX 428, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

PLANT ENGINEERS

Experienced on layout of all types of foundry equipment, material handling and material flows. Send complete details on work history, education and family status. Include recent photograph. All replies confidential.

BOX 419, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

IRON MOLDING FOREMAN

Gray iron molding foreman for semi-mechanized jobbing foundry in North Jersey metropolitan area. State age and experience.

BOX 420, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SAND TECHNICIAN

Experience in gray iron foundry, and all phases of sand conditioning. Good opportunity. Relocate Middlewest.

BOX 414, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

NONFERROUS FOUNDRYMAN

With good training in metallurgy, experience in gating, risering, pouring and molding copper-base alloys and who has supervisory qualities, to assume direction of sand and centrifugal foundry in Indiana. Send complete details, education, experience, health, weight, salary required. Address: Box 432, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRYMAN

With good training in metallurgy and sound practical experience, who has supervisory qualities to assume direction of sand, permanent mold and centrifugal foundry department of northeastern Ohio corporation. Give full particulars and references in letter. Address: Box 402, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN

Brass foundry located in small town, Washington, D. C. area, needs experienced foundry foreman. Must be capable of supervising bench, machine, and shell molding, and all foundry operations. Excellent opportunity for right man. Address: Box 411, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Long established East Coast iron foundry seeks young man with minimum three years' foundry experience to assume responsibility for slinger operation. Send resume including education, experience, and salary requirements. Address: Box 418, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES ENGINEER

Experienced in steel castings. Chicago and surrounding area. Good opportunity for right person. Address: Box 395, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

HELP WANTED

Experienced core room foreman wanted for gray iron foundry making small castings. Address: Box 415, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited
From Employers and Qualified Applicants

For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. FINANCIAL 6-8700
JOHN COPE, DIRECTOR 29 E. MADISON ST., CHICAGO 2, ILL.

Help Wanted

TECHNICAL CONSULTANT

For radiator castings wanted by European foundry. He must be willing to go to Europe for six months. Address: FINMECCANICA DELEGATION, 11 WEST 42ND STREET, NEW YORK 36, NEW YORK.

Positions Wanted

MANAGER-SUPERINTENDENT

Thorough knowledge of all phases of steel and gray iron foundry operations including cores, sand, molding, pattern layout, gating and risering, melting, laboratory, etc. Degree in Metallurgical Engineering. Excellent labor relations. Presently employed. Address: Box 421, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Experienced in supervision and technical aspects of gray iron foundry operation. Young and enthusiastic about foundry work. Seeking responsible position in a gray iron foundry in New England. Address: Box 424, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRY SUPERINTENDENT

Good working knowledge of all phases of nonferrous foundries. Understand gating, sand control in both foundry and core room. Can produce castings for chrome plating. Two and one-half years of metallurgical training. Address: Box 387, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Metallurgical background, 20 years' experience, cupola melting, iron and casting quality control, sands, laboratory, production and jobbing. Will relocate, employed, age 48. Address: Box 390, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Practical foundryman, nationally known for a job well done. Age 46, good health, now employed. Looking for more action, ferrous or nonferrous. Address: Box 426, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MAINTENANCE OR PLANT ENGINEER

Twenty years' experience in this field, capable of setting up and operating a sound preventive maintenance program. Broad knowledge of plant layout and planning. Now employed. Interested in relocating. Address: Box 422, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

SOUND TECHNICAL AND PRACTICAL BACKGROUND IN FERROUS CASTINGS. EXCELLENT SALES AND ADVERTISING MANAGEMENT RECORD. INTERESTED ONLY IN AGGRESSIVE GROWTH COMPANY. DESIRE POSITION AS GENERAL MANAGER OR SALES MANAGER. AGE 42. EMPLOYED. ADDRESS: BOX 423, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

PERMANENT MOLD ENGINEER

Graduate Metallurgist with 25 years' experience in light metal castings. Handle all phases of engineering or supervise complete operation. Interested in process development. Address: Box 391, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

METALLURGIST

With 28 years' experience production of cupola and electric furnace gray iron, high alloys, sand, and laboratories. Desire position in metallurgical, quality control, or service departments. Willing to travel. Address: Box 430, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALARIED PERSONNEL

$5,000-$30,000. This nation-wide service successful since 1927 finds openings in your field. Sells your abilities; arranges contacts. Present position protected. Write for details. Address: JIRA THAYER JENNINGS, P. O. BOX 674, MANCHESTER, VERMONT.

Positions Wanted

SALES MANAGER

PRESENTLY EMPLOYED BY PLUS 100 TON A DAY GRAY IRON AND DUCTILE FOUNDRY. EXPERIENCED AS A MOLDER, COREMAKER, ASSISTANT SUPERINTENDENT, CHIEF METALLURGIST AND RESEARCHER IN SHELL, CO2, NODULAR, BERYLLIUM, ETC. GOOD ADVERTISING AND CONTRACT PROPOSAL EXPERIENCE. EXCELLENT SALES RECORD. AGE 42. SALARY REQUIRED, $14,400 YEAR. ADDRESS: BOX 425, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

SUPERINTENDENT

Technical background, experience in all phases of gray iron production. Costs, efficiency and good methods are uppermost. Present day margins require close controls and good leadership. Address: Box 427, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SALES MANAGER

Career foundryman with 20 year background in steel casting sales and management throughout Midwestern and Eastern Area. Experienced in all phases of sales, costs, production control and product development. Address: Box 412, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

POSITION WANTED

As salesman and trouble shooter for gray iron and semi-steel foundry in Western Michigan. Approximately 40 years' experience in all phases of foundry operations and as owner. Address: Box 417, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 394, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

Open Capacity

NOTICE

Have extra fine-grinding capacity and will custom grind ores such as Iron, Manganese, Chrome, Zirconium, etc. to buyer's specifications.
Prefer inquiries for carload shipments.

UNION MINING COMPANY
2306 FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PA.

Representatives Wanted

AGENTS WANTED

Distributors or Manufacturer's Agents. Several choice territories available to experienced foundry equipment salesmen or agencies interested in selling the world-famous HANSBERG CORE SHOOTER. Hansberg is the most successful coremaking machine of the last ten years and is better than competitively priced. More models than any other manufacturer in this bracket. New bench and floor models include semi- and fully-automatics, combination shooter-gassers, rollover-strippers, vacuum and pressure CO2-gassers.

HANSBERG SHOOTERS, INCORPORATED
P.O. BOX 729
EVANSTON, ILLINOIS

SALES REPRESENTATIVES

Here is an established competitively-priced line you can count on for a good income. Milward Alloys, a leading manufacturer with a strong reputation is now in the process of localizing many sales areas to give better service to customers and prospects from coast to coast. A considerable number of territories are open. We need men who will take them on, full or part time.

You may now be serving the trade or you may have foundry experience. Maybe you're retired with time on your hands. Regardless of your situation, you will be amply rewarded—because Milward's line is broad and in constant demand. Milward alloys cut foundry costs. Orders are promptly filled. That's why we have a substantial reorder business.

The Milward line includes: copper shot; phosphor copper and other powerful deoxidizers and degasifiers; aluminum bronze and manganese bronze hardeners and ingots; copper silicon, copper manganese, copper iron, copper aluminum and copper chrome alloys; nickel copper and nickel iron alloys; aluminum titanium, aluminum silicon, aluminum manganese, aluminum iron and aluminum copper and other alloys.

Phone or send us a letter describing the area or locality you can cover, whether full or part time, and tell us a little about yourself . . . your qualifications, experience, and when available. This may well be the connection you've been waiting for. Write or phone: Mr. David B. Milward, President. Phones: Lockport, N. Y. 4-0435, or Buffalo, N. Y. LUdlow 6425.

MILWARD ALLOYS, INC.
Lockport, N. Y.

MANUFACTURERS' REPRESENTATIVES

A completely modern electric furnace foundry specializing in shell molding of high strength alloy iron castings and brass castings, desires to appoint manufacturers' representatives in Midwest and Middle Atlantic States. Foundry can meet exacting specifications for physical properties, chemical analysis and microstructure. Men now calling on industrial accounts who require good production quantities of small castings are urged to write. List all qualifications, experience, current principals, etc. No objection to other non-conflicting foundry lines. Address: Box 431, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

REPRESENTATIVE WANTED

We would like a man who is currently calling on pattern shops and foundries to sell a complete line of pattern lacquers. Address: Box 373, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representative Available

REPRESENTATIVE AVAILABLE

Eastern foundry equipment representative looking for a few additional lines. Engineering and sales experience with good coverage and services. Address: Box 433, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

HEVERLE & HAY
ENGINEERING—ACCOUNTING
CONSULTANTS TO INDUSTRY
(Since 1907)
COST CONTROL—COST REDUCTION
FOUNDRY METHODS
121 NORTH BROAD STREET
PHILADELPHIA, PA.

CONSULTANT WILL SOLVE PROBLEMS OF: Smelters, refiners and foundries in brass, bronze, aluminum and white metals. Cost reduction in production of primary and secondary raw materials to finished alloys and castings. Design and construction of furnaces a specialty. 25 years successful experience. Address: HARVEY C. CHADEN, 1722 EAST BADER AVE., SOUTH BEND, INDIANA, CENTRAL 2-3255.

FOUNDRY CONSULTANT—NONFERROUS

Sand — permanent mold — centrifugal permanent mold — and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, 253—8th STREET, WEST PALM BEACH, FLORIDA, PHONE: TEMPLE 2-8685.

Foundry for Lease

TURNER FOUNDRY FOR LEASE

All metal and masonry building approx. 12,500 sq. ft.
Concrete floors, sprinkling system and R. R. siding
Modern Trumelt cupola #1 42 x 32
American Wheelabrator Tumblast
American Rotary Wheelabrator
Twin grinders connected with dustube dust collector system to all cleaning equipment
Overhead traveling electric crane
Core baking equipment
And all equipment needed for immediate operation
Adequate labor, both skilled and unskilled, is available
For further information contact:

L. GORDON
DRAWER 1192
STATESVILLE, NORTH CAROLINA

Wanted-To-Buy

WANTED

Used or broken Silicon Carbide Grinding Wheels of any kind or size, regardless of bond. Will pay $35.00 per ton.

UNION MINING COMPANY
2306 FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PENNSYLVANIA

WANTED

One used Simpson Sand Muller, No. 1½ or No. 2 size. Complete with all controls including sand storage hopper if available. Address: GENERAL MANAGER, IRWIN-SENSENICH CORP., SHAFTON ROAD, IRWIN, PENNSYLVANIA.

WANTED

Used aluminum core plates, ribbed, ½" thick, sizes from 24" square to 36". Address: MORRIS BEAN & COMPANY, YELLOW SPRINGS, OHIO.

MIXER WANTED

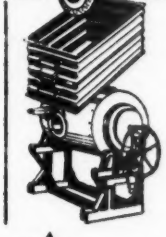
Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WANTED

Osborn Model 716PJ Molding Machines. Must be in good condition. Address: Box 429, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO



DUST COLLECTOR
1—Whiting Hydro-Clone, wet type, 4,000 c.f.m.

WHEELABRATORS
1—36" x 42", 11½ cu. ft. Tumblast, w/loader
1—42" x 48", 17½ cu. ft. Tumblast, w/loader
1—18 cu. ft. Pangborn Blastmaster

MAGNESIUM CLEANING CABINETS
6—90" x 100" x 65" with exhausters, 8000 c.f.m.

MOLDING MACHINES
1—Rotalifts, 3160
2—TDA4 Taccones

SAND SLINGERS
1—B-P Riddle type, 19" head, 4" tip
1—B-P Motive Jr., 19" head, 4" tip
1—B & P Dbl. Belt type, 19" head, 4" tip

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACE
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

Foundry Wanted

FOUNDRIES • WANTED • EQUIPMENT
FERROUS—NONFERROUS

Production — Jobbing — Captive — Nationwide foundry investment organization expanding. Complete foundry with or without property will be considered. All replies confidential. PRINCIPALS ONLY.

BOX 396, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

For Sale

FOR SALE

Fisher Furnaces #600 MNP
Fisher Furnaces #400 MNP
Campbell-Hausfeld Tilt Furnaces
Campbell-Hausfeld Stationary Furnaces
Stedman Core Crusher, Hammer Mill
Skip Hoist for 9½ Foot Cupola—complete
Osborn #405 Rollovers
Mold conveyor 268' long
Elevators
Belt Conveyors
Shakeouts
International Rollover RES
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin Lift, jolt
Osborn 710J, Pin Lift
Osborn 212J, Jolt Squeezers
Osborn 275J, Jolt Squeezers
Osborn 276J, Jolt Squeeze
International LSJ, Jolt Squeeze
International PJS, Jolt Squeeze
Milwaukee 104 Jolt Squeezers
Champion JS 108 Jolt Squeeze
Arcade 100S Jolt Squeeze
Spo 110 Jolt Squeeze
International Rollover 2410 G portable
International Rollover 30 x 8 no jolt
J & J 610 rollover portable
International pin lifts
Davenport pin lifts
Osborn 559 pin lifts
Spo 506 jolt rollover, pin lift, draw
International Type R core rollover, hand
Swing Grinders
Royer sand preparators
B & P preparators
Blystone sand mixers
American Sand Cutters, Models M, AM, AA
Coleman core ovens
Grinders ½ hp to 25 hp
Disc grinders
Ladles from 50 to 10,000 lb.
Pouring Devices 500 lb. to 2000 lb.
Gyratory riddles
Monorail and bridges
Air Hoists 250 lb. to 10,000 lb.
Overhead chain conveyor #458, track, drives.
Blowers-Centrifugal-positive-exhaust
Dust collectors all sizes

FLASKS
ALUMINUM
SLIP and POP
Sizes from 10" x 10" to 48" x 48"
JACKETS
Aluminum and Iron
STEEL FLASKS
Sizes from 10" x 15" to 9' x 9'
CORE PLATES
Transite——Iron——Aluminum
MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE
THE HOMAN MACHINERY CO.
710 E. FRONT ST. MAIN 10339
CINCINNATI 2, OHIO

FOR SALE

1—Tabor Rollover Molding Machine 22 x 30—Draw 600# capacity, Portable complete with air clamps and leveling devices....$650.00
1—Tabor Portable Jar Pin Strip Machine 32 x 32 Table 10" Draw 600# capacity ..$750.00
2—SPO Jolt Squeeze Machine Model 110J .....$175.00 each
2—International Jolt Squeeze Machines ....$75.00 each
1—Redford Cartridge Core Blower $50.00
1—Dietert Varitemp Combustion Furnace complete with $50.00 extra tubes etc. ..$80.00

COLUMBIANA PUMP COMPANY
COLUMBIANA, OHIO
TELEPHONE: IVANHOE 3-3383

FOR SALE
DETROIT ROCKING FURNACE

Type AA with cylindrical shell, 1200 lb. cold or 2600 lb. hot metal, complete with mechanical and electrical equipment, oil filled Kuhlman transformer 11,000 volts primary, 125 volts secondary, 2800 amperes full load, installation drawings, unused and crated ten years. Ideal for alloy irons, brass or bronze. Price f.o.b. local cars $6,500.00. Address: HOPE ELECTRICAL PRODUCTS CO., 39 LONG AVENUE, HILLSIDE, N. J., ELIZABETH 4-7837.

For Sale

FOR SALE

SIMPSON MULLER #2 (UD) 20 HP Motor 3/60/220-440
MOULDERS' FRIEND 50" Brush with spare brush 15 HP Motor
SAND SLINGER (B&P) Stationary 19" x 4" w/motors 3/60/440
SHEPARD-NILES 5-Ton Electric Charging Hoists (2)
FOUNDROMATIC Shake-Out 3 x 5 w/Motor and Starter
NATIONAL Hot-Sand Belt Conveyor w/Magnetic Pulley
NATIONAL Bucket Elevator
NATIONAL Rotating Screen
50-Ton SAND STORAGE BIN
Other good equipment—send us your inquiries

W. O. McMAHON
BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONE TREMONT 1-2088

FOR SALE

1—#3 National Engineering Straight Lift Bucket Loader—35 cu. ft. capacity. Will lift and discharge 25 ft.

THE ANDREW TERRY COMPANY
TERRYVILLE, CONNECTICUT

FOR SALE
MOTORS—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51 — Rochester 1, New York

FOR SALE

Used Investment Casting Equipment
15 lb. Arc Melting Furnaces, Wax Injectors, 2" Porter-Cable belt grinders. Excellent Condition, Reasonable.

HULVER & MERRILL
SALES REPRESENTATIVES
5837 SWOPE PARKWAY
KANSAS CITY, MISSOURI
HI 4-1123

FOR SALE

USED HEAT RESISTING CONVEYOR BELT
Also AIR FILTER BAGS for dust collectors. REPAIR your bags at a fraction of original cost.
Check our prices before you buy.

CORNS CONVEYOR BELT COMPANY
GRIFFITH, INDIANA

MILLER STARS

Approximately 20 tons available, 1½", approximately $165.00 per ton.

BOX 413, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter-Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100# pressure with 300 HP motor.
3—Link Belt Roto-Louver Rotary Dryers, Models, 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

1—Morris Cupola, size #9 with jib hoist and mixing ladle. Bucket-charged with two buckets complete with steel and metal building and jib crane. Also 1—blower for above, make "Sutorbilt Corp." 758P-M-24662, complete with Gardner-Denver air compressor and 75 HP General Electric motor and Fox air weight control and windbox Gardner-Denver air compressor for Foxboro. Good condition. Used for one year. Also, 2000 ft. of American Monorail and switches. Address: JOHN B. LAGARDE, INC., BOX 389, ANNISTON, ALABAMA.

FOR SALE

Excellently maintained equipment that fits most every type foundry.

AERATOR
Jeffrey Type 1—Ser 474 A/C Mtr. Drive

COMPRESSORS
Fuller Rotary—Serial 2756-A. Max. Pressure 100 lbs. 150 H.P. Synch. 220/440 Mtr.
Westinghouse—Type Q-3VD. Max. Pressure 100 lbs. 100 H.P. Mtr. 220/440

CUPOLAS
Calumet Engr. Wrks. #7 Size 72" Dia. x 55' High
Whiting #4—54" Dia. x 55' High

CONVEYORS
Apron Steel 20' Centers x 24" Wide
Flat Belt & Troughing Conveyors 52' Centers x 24" Wide, 16' Centers x 24" Wide, 90' Centers x 30" Wide, 34' Centers x 24" Wide and other assorted lengths

HOPPER LINE
19 Station—Molders Hoppers and distributing belt 152' Centers x 24" Wide—Plows and self supported structure. Bartlett and Snow design.

CORE BLOWER
San-Blo CB-40-D—Ser. 100-115 Complete with pulsator kit.

CORE OVEN
Vertical Carl Mayer Tower Core Oven—45' Overall Height—30 Racks—Pit Type—12" x 13' x 12' depth

CRANES
(2) Northern Engr. Co. Cab Type, 5 Ton, D/C —4 Mtrs. Wall Cranes H-Beam Boom 20' Long, Lift 18'.
(1) Cleveland 15 Ton, 4 Mtrs. D/C.—75'9" Span. Lift 25' and 5 Ton Aux. Hoist.
(1) Milwaukee Crane Cab Type—7½ Ton, 3 Mtrs. D/C. 75'9" Span. Lift 25'.
(1) Harnischfeger Corp. Cab Type, 3 Ton, D/C, 3 Mtrs., 36'8" Span, lift 20'.
(2) Northern Engr. Co. Cab Type, 5 Ton, D/C, 3 Mtrs., 18' Span, Lift 15'.

DUST COLLECTORS
(1) American Air Filter Size 20 Roto Clone Type N—Cl Des-2, Hydrostatic Precipitator Serial #52103, 50 H.P. 220/440.
(1) American Air Filter Size 33 Type W, Arr. A, Serial #W 52017, Roto Clone.

GRINDERS
(2) U. S. Elect. Tool #65 D. E. Heavy Duty, Snagging Grinders, 4 Speed. 10 H.P. 220 Volts.
(1) Fox Swing Grinder, 15 H.P. 220/440.

BUCKET ELEVATORS
(3) 45', 48', 35' Centers all with 17" wide belts and 16" Buckets.

HOIST
(6) Ingersoll Rand & Bugit 4000 lbs. and 2000 lbs.

LADLES
(14) Vertical & Horizontal 800 lbs. to 9 Ton Capacity Modern & Industrial all with "V" bails.

MOLDING MACHINES
(1) SPO—3102 Jolt Strip Stationary with Elect. Jolt Timer. Table 52" x 38". Perfect
(1) SPO—9546 Jolt Squeeze-Rollover and Draw. Stationary. Table 26" x 34". Perfect
(1) SPO—2166 Jolt Squeeze-Strip. Table Size 34" x 26" Pin. Centers, 21" x 32". Perfect Mechanically
(1) Milwaukee #165—8 Jolt Squeeze & Draw, Stationary. Less than one weeks use
(4) Milwaukee #124—6 Portable Jolt Squeeze.
(3) Internationals Type G, Table Size 24" x 10". Jolt Rollover, Draw and Portable. Good Condition
(1) Davenport Jolt-Rollover and Draw. Table 24" x 20". #22 Model—Stationary.

MULLERS
(2) B/P #70 Speed Mullers—Ser. 127-4711 and 130-4711 Completely Equipped. Water meters and cooling
(1) B/P #40 Speed Mullers—Ser. 4043 With Skip Loader.

SANDSLINGER
(1) Motive Jr. 12' Arm, 36" Track Gage. 25/16 H.P. Ramming Mtr., 5 H.P. Con. & Elevator Motor. 5 H.P. Travel Mtr. (2) 200 Cu. Ft. Portable Sand Hoppers.

SAND STORAGE
(1) 100 Ton Sand Storage Hopper Self Supporting.

SHAKEOUTS
(3) Simplicity's 5' x 10'. (1) 3' x 5'.
(1) Hewitt Robins 5' x 8'.
(1) Allis Chalmers 5' x 8'.

WHEELABRATOR
(1) American Wheelabrator 48" x 72" with Skip Loader. (Late—Under Power—Excellent Condition)

Most of this Late Type Equipment Under Power, Can Be Demonstrated

WISCONSIN GREY IRON FDRY. CO.
2569 NORTH CAMBRIDGE AVE.
MILWAUKEE 11, WISCONSIN
WOODRUFF 4-1500 EDGEWOOD 2-0210

Circle 902 on Page 51

For Sale

FOR SALE

Robins Floatex SSC Unit 5′ x 6′ 12,000# cap. New 1951
Hough HA Payloader, 1951, Rebuilt engine, pneumatic tires
Bondactor Gun, model 1000, complete with straight & rt. angle nozzles. New 1950
Jeffrey Vibrating Feeder 10′ x 12′ with 2.5 KW power supply, new 1950
Yale & Towne 3Ton "Cable King" Hoist with pendant & trolley
Cleveland Tramrail Hoist (LoHed) 2Ton cap.
Link Belt Steel Apron Conveyor 20′ x 24′ with Link Belt Speed Reducer & 5 HP TC motor for use under sand bin.
Chaplets, 4000# tinned steel, purchased from iron foundry that ceased operations, selling at 30% of list, min. order 100#

MEECH FOUNDRY, INC.
9906 MEECH AVENUE
CLEVELAND 5, OHIO
MICHIGAN 1-5550

FOUNDRY EQUIPMENT

Molding Machine #42 Jolt Roll-Over
Demmler Core Blower, including Sand Elevator
Shell Molding Machine, Model H 04-1483, w/Timer, oven, etc.
No. 998 Crucibles, (15)
No. 150 Crucibles, (13)
Core Blower, Demmler #1
5 Melting Furnaces, Oil-fired, Motorized, Tilt type for Brass. No. 300 Crucible cap. with burners
Blower "Spencer-Turbo" Compressor, 30 HP Motor, 24 oz.—1800 RPM
4 Blowers "Spencer-Turbo" Compressor, 110 CFM, 12 oz., 1½ HP
Portable Conveyor, "Trowbridge"

MR. WARD
BOHN ALUMINUM & BRASS CORP.
WO 3-0655

FOR SALE

1—32" x 48" (13" Cylinder) heavy duty Herman Molding Machine. Wear Plate Impact Bumper Type, Capacity 4000 lbs. Rollover Serial No. 1087, Bumper Serial No. 3136. Address: GLAMORGAN PIPE AND FOUNDRY CO., P.O. DRAWER 740, LYNCHBURG, VIRGINIA.

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

$70,000 worth new Pangborn and Wheelabrator parts. Priced 25% less than list.

6′ LF-14 Pangborn Table	$2200.00
9′ LG-14 Pangborn Table	4500.00
6′ LG-14 Pangborn Table	2500.00
Pangborn 14 GK Blaster	
Pangborn 8 x 8 Room	2800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tum. w/loader	4500.00
42 x 48 Wheelabrator Tum. w/loader	2500.00
27 x 36 Wheelabrator Tum. w/loader	3000.00
15 x 20 Wheelabrator	1800.00
8′ Wheelabrator Table Blast	2000.00
4′ Pangborn Table Blast	2500.00
14 LG5 Pangborn Rotoblast Multi-table 4/5—5′ tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or Blast Equipment too numerous to mention.

Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5854 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE

No. 9 Whiting Cupola, complete. 20 x 60 Roots-Connersville Blower, 2 motors, 75 HP, switches, belts, sheaves, bases, etc. Foxboro equipment. This equipment less than five years old. 1 No. 4 cupola with Foxboro equipment. The lot $7,500 loaded carrier. Address: A. A. OSWALD, BOX 121, GALVA, ILLINOIS.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: **BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.**

For Sale

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVENUE
DAYTON 3, OHIO

FOR SALE

Pangborn Rotoblast Type E8-192, designed for cleaning of bath tubs. Unit complete with Schneible Collector, 825 gallon skim tank—two pumps. Blast cabinet 45′ 6" x 11′ 6". Seven rotors with 20 HP motors, 36 hooks on trolley conveyor—2 grit elevators, 6 separators. Spare parts inventory included. Unit offered on, as is—where is basis.

RHEEM-RICHMOND PLUMBING FIXTURES DIV. RHEEM MANUFACTURING COMPANY
P. O. BOX 111
METUCHEN, NEW JERSEY
Attention: Purchasing Department

FOR SALE

Beardsley & Piper Speedmuller, Model 70, Serial 1938394 with late bowl and muller wheels. Complete with continental 100 HP 3 phase, 220/440 volt motor, 60 cycles. Make offer. Address: GEORGE F. PETTINOS, INC., P.O. BOX 27, MILLVILLE, NEW JERSEY.

FOR SALE

Lectromelt Type D, size 6, Serial #203, 175 K.V.A. transformer, G. E. Controls. Melting rate 500 lb. per hour. Address: Box 377, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Now Liquidating

OLIVER CORPORATION'S Gray Iron and Malleable Foundries at 533 S. Chapin St., South Bend, Indiana. LATE TYPE Foundry Equipment.

FOUNDRY

5—B&P #80 Mullers
1—P K Single Stage Mix Muller
6—Molders Hoppers Lines
100—Molders hoppers 35 cu. ft.
7—42" "No Leak" Steel Apron Conveyors
20—Belt Conveyors, flat trough, and magnetic pulley types.
2—Revivifiers & Sand Screens
2—Royer NB2—Royer NRS
1—B & P Screenarator—Large
4—Overhead Sand Bins, 2,000 to 4,000 cu. ft.
10—Shakeouts 5′ x 10′ to 30" x 40"
5—Oscillating Pan Conveyors
6—Bucket Elevators—51′—60′ centers
90—MOLDING MACHINES—SPO 2192R, 2148—2136—214—113—110's Milwaukee 214 & 244's
OSBORN ROTOLIFT 3161—276—275
SPO 507 Rollover-413D; Champion Pin Lifts AL2428
6000′—ROLLER CONVEYOR—14" —26"

CLEANING ROOM

Gardner 72" Horizontal Disc Grinder
WHEELABRATORS — 2 — 48" x 48"—2—48" x 42"
TUMBLING BARRELS Whiting 30" x 48"
GRINDERS HISEY WOLF 24"—20"—18" wheels
Dust Collectors—Rotoclones, Bag-type Collectors, Whiting Hydroclone

CORE ROOM

Demmler 4EO, 3EO, 2EO, 2K—#2—#55—#50
Champion—CB5—CB15—CB18
Redford Bench type, International SB 13
Coleman Car type Ovens—Young Bros. Continuous
Core Rack, Coreplates, Core Buggies

MELTING DEPARTMENT

3—Whiting #7 Cupolas
1—Whiting #6 Cupola
1—Air Furnace
2—Whiting Allis Chalmers Cupola Blowers, 5800 cfm 20 oz
2—Whiting 30A Coal Pulverizers
2—Whiting 18" x 36" U Ladles

Weigh Hoppers, scrap scales, scrap and coke storage bins, Canton scrap shear, Whiting Slag disposal units, 36 Modern pouring devices.

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Chicago Office & Warehouses • 126 S. Clinton St., Chicago 6, Illinois • ANdover 3-3430

Circle 903 on Page 51

AAA Brings You Another "BLUE CHIP" Foundry Liquidation

COMPLETE MODERN GRAY IRON FOUNDRY, MACHINE SHOP, HEAT TREAT DEPT., FORGE, PATTERN SHOP & MATERIAL HANDLING EQUIPMENT

on the premises of the

SACO-LOWELL SHOPS INC.

P. O. BOX 465 — BIDDEFORD, MAINE

AIR COMPRESSORS
1—SULLIVAN Model WG-9, Size 8 x 7, Vertical, w/40 HP Motor, w/Aftercooler & Tank.

AIR & ELECTRIC HOISTS
1—I&R Size D-6, 6000# Air Hoist.
8—SHEPARD NILES Electric Hoists, 2-ton cap., Class A-4, 4 HP Motor.
2—KELLER Air Hoists, ½-ton cap.
8—Y-T Chain Hoist, ½ to 3-ton.

BUCKET ELEVATORS
1—NATIONAL ENG. CO. 59' 2" Tandem, 36" Belt, 2 rows 16 x 8" Buckets, Casing size 45" x 55".
1—NATIONAL ENG. CO. 60' Centers, 16 x 8" Buckets, 18" Belt.

BELT CONVEYORS
15—NATIONAL & LINK BELT flat & troughing type, some w/plow-off stations, some w/magnetic pulleys, various lengths & widths from 24" x 20' to 24" x 160', All sizes.

CRANES & RUNWAYS
1—ELECTRO-LIFT 6-ton, 30' span.
1—SONDER 5-ton cap. Cab operated, 30' span.
1—CHESAPEAKE 5-ton cap. Cab operated, 45' span, Double Girder, w/70' runway.
5—SHEPARD NILES 2-ton cap. 20' span
2000' CLEVELAND TRAMRAIL 3" high T-rail, w/hangers, curves, switches etc.

CUPOLAS & EQUIPMENT
2—SLY 82" dia. Cupolas, 80' high.
1—ROOTS-CONNERSVILLE Cupola Blower, Positive, size 22 x 66", w/50 HP
1—ATLAS Charging Scale Car, 7' W x 8'6" L, w/Fairbanks Morse Scale, 12,250# cap. Platform 5 x 9'.
6—WHITING Charging Buckets 44" x 37"
1—SHEPARD 3-ton Charging Crane, Underslung, Cab operated.
1—AMERICAN Slag Quenching Tank, w/Chain Elevator, 16 x 7" Buckets.

DUST COLLECTORS
1—AAF Rotoclone, Type W, Size 24, Arrangement C, w/40 HP Motor.
2—AAF Rotoclones, Type N, Size 12, Class 750, w/Sludge Ejectors.
4—TORITT #81 Dust Collectors.

GRINDERS
3—BRIDEPORT Model 162 Double End Snagging, 3-speeds, 24 & 30" Wheel.

HEAT TREAT FURNACES
2—G. E. Pusher Type Cast Iron Annealing Furnaces for 30-ton cap. for 24 hrs., width 50", Heating Chamber 16'4" & a Cooling Chamber of 34', door 11½" high. Rating 238 KW for heating cast iron parts 1500° F. & for cooling below 500° F., Max. temp. 1750° F., w/G.E. Atmosphere Gas Converters, rated 1500 CFH.

3—CHICAGO Flexible Shaft Gas Salt Bath 18 x 30 x 18" deep, 800° F.
2—STEWART INDUSTRIAL FURNACES 43 x 53" O.D. Tank 20 x 30", Gas.

HOPPERS & STORAGE BINS
1—NATIONAL 200-ton cap. 18' l x 15' h x 12' w w/4-batch Hopper, 2-compartment.
32—NATIONAL ENG. 1½ ton cap. Moulders Hoppers, w/Undercut Gates.

LADLES & POURING DEVICES
15—WHITING & MODERN, 1500 to 6000# cap. enclosed gear.
6—MODERN F-9 & FA-9 Pouring Devices.

MACHINE TOOLS
1—AMERICAN TOOL WKS. 3½ x 9" Column Radial Drill, Triple Purpose.
1—ARMSTRONG "Marvel" Power Hack Saw, Model 6A.
1—W & S #2A Turret Lathe.
1—AMERICAN 16 x 36" Engine Lathe.
1—REED PRENTISS 16 x 60" Engine Lathe, QCG, Motor in Base.
1—PUTNAM Engine Lathe, 22" x 96" w/20" 4-jaw chuck.
1—GOULD & EBERHARD Shaper, 20", w/12" Shaper Vise.
1—LELAND GIFFORD 14" Upright Drill.
1—GREENERD #58 Floor Arbor Press.
1—MARVEL #4B Power Hack Saw.
1—CIN. BICKFORD 3' Arm, 9" Column.
2—ROCKFORD 16 x 30" Lathes, QCG.
1—HENDY 16" x 8' Yoke Eng. Lathe.
1—VAN NORMAN #2 Duplex Mill.
1—BECKER #5C Vertical Mill.
1—L. O. FARQUHAR Open Side Planer, 18 x 46" Surface.
1—WOODWORTH & POWELL Model B-10 Planer, 21 x 72" Table.
1—FAY & SCOTT 24 x 60" Engine Lathe.
1—CINCINNATI #3S Horizontal Milling Machine, 16-speeds, 15—375.
1—HENDY 16 & 36" Engine Lathe.
1—AMERICAN Radial Drill, 4'10" Arm x 57" Col. Quick Change, 8-speeds.
1—SOUTH BEND 9 x 36" Lathe.

PATTERN ROOM EQUIPMENT
1—J. A. EGAN 20" Planer.
1—WHITNEY Model 32 Single Spindle Wood Planer, 30".
1—Wood Turning Lathe, 16" x 6'.
1—S.A. WOODS Model #184 Wood Band Saw, 36" Throat.
1—CRESCENT 12" Wood Joiner.

MATERIAL HANDLING EQUIPMENT

Electric Clamshell Buckets
3—SHEPARD Model B-10, w/10,000# cap. Electric Hoist, 1⅛ & 2 yd. cap.

Electric Magnets
1—O. S. WALKER Model 48, 48" square Lifting Magnet, 5-ton cap., 220 Volt DC. (New 1958).
1—Elec. 30" Magnet—Crane Type.

Electric Fork Lift Trucks
5—CLARK Model 4024 Electric Carloader, 5000# cap. Telescopic 60" lift.
2—CLARK Model 4015 Electric Carloaders, 4000#, 60" lift. New 1948.
1—CLARK Model 2024, Electric Clipper. Telescopic, 36" Fork, 60" Lift.
1—YALE Model K23E-6 Electric Platform Truck, 6000# cap. 55 x 27" Platform.

Walking Fork Lift Trucks
4—AUTOMATIC TRANSPORTER Model SCLT-42 Stackers, 48" lift, 2350# cap.
1—LIFT TRUCKS INC. 48" Fork Electric push-button Travel, Hand Hyd. Lift Stacker, 2350# cap.
1—MONOTRUCK Automatic Stacker, 36" Fork, 58" lift, 4000# cap.
1—AUTOMATIC TRANSPORTER Electric 27 x 60" Platform, 4000# cap.
1—YALE & TOWNE Model M4DP27-48 4000# cap. 48" Fork, 6" lift.

Manual Lift Trucks
18—Y-T and L.S. hyd. lift, manual oper., 36, 42 & 48" L forks, by 27" W., 4000# cap. New 1950.

Misc. Gas & Elec. Powered Equip
1—OLIVER Straight Line Loader, "Gasoline Driven" Snow Loader.
1—CLARKETTE Towing Tractor, w/Power Brush & Snow Sweeping Attachment.
1—WAGNER Scoop-Mobile, 3000# cap. Gasoline Snow Loader. New 1946.
8—YALE & BARRETT towing tractors.
1—BUDA Chore Boy, 2000# cap., Platform Body, Gasoline Driven.
2—STEUBEN Pallet Movers, Electric.

MOLDING MACHINES
1—HERMAN 6000# Series Jolt Rollover Pattern Draw Machine, w/40 x 58" Plain Jolt Machine, w/Air Clamps.
1—TABOR 40 x 44" Plain Jolt Bumper Machine, 15" dia. cyl.
27—TABOR 10" Cyl. Jolt Squeezers, Yoke type, 18 x 18" Table.
1—ARCADE Model 221 Jolt Rollover Pattern Draw, 14 x 36" Table, Portable.

MOLD CAR CONVEYORS
1—LINK-BELT, 160 cars, made up in 4 loops. Car tops 19 x 41", 550' of Track & Chain. Automatic Dumping, w/Cooling Tunnel.
1—PALMER BEE, 74 cars, 16 x 69", 800' of Track & Chain, Automatic Dumping, w/Cooling Tunnel.

OVERHEAD CHAIN CONVEYORS
1000' #458 Chain Conveyor, w/PALMER-BEE #441 4"-Trolleys on 2' Centers, w/20 x 30" Trays on 4' Centers.

STEEL APRON CONVEYOR
1—NATIONAL 36" wide x 150' C to C x 9" high pans. Leak Proof.

SHAKEOUTS & VIBRATING CONVEYORS
1—SIMPLICITY 4 x 10' Model BG.
2—SYNTRON Model F-45 Vibrating Feeders, 30" wide x 84" long.
1—SIMPLICITY Model JA2 Vibrating Pan Feeder, 2 x 6' length.

SAND BLAST EQUIPMENT
1—AMERICAN WHEELABRATOR 36 x 42" Tumblast w/Skip Hoist Loader.
1—PANGBORN type NF-55 Sand Blast Room, 12' W x 12' L x 7'6" H.
1—PANGBORN type NF-40 Sand Blast Room, 9'6" W x 15' L x 7'6" H.

SAND MULLERS
2—SIMPSON #3 UD 8' dia., w/Dust Hood, Batch Hopper, Air Discharge, 40 HP Motor, Automatic Cycle, 3000# Batch Cap.
1—SIMPSON #3 Style C Sand Muller, 8' pan dia., Open gear, w/40 HP Motor.
1—NATIONAL #3 Aerator for Muller.
1—NATIONAL #3 Straight Lift Bucket Loader, Skip Hoist Type.

WHIRL-AIR FLOW (1957)
1—WHIRL-AIR FLOW #300, 30 cu. ft. cap. Transformer.
2—WHIRL-AIR FLOW 2-way Transfer Switches.
3—WHIRL-AIR FLOW Sand Receivers 36" dia., 24" high. Approx. 360 lineal ft. 4" extra strong Seamless Pipe.
4—WHIRL-AIR FLOW Booster Fittings to supplement Transporter.
2—Station Transporter Controls.
1—Control to Shut the Feeder off when Batch capacity reached.
1—SIMPLICITY 24" wide x 6' length Model JA Feeder.
1—Track Hopper.

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THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

AIR COMPRESSOR
CHICAGO PNEUMATIC DCE 24; 14½ x 17; 2 Stage
6 x 7 INGERSOLL-RAND

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
INGERSOLL-RAND 13,000 cfm, 32 oz., 150 hp., 220 V
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 58 hp. motor
NORTH AMERICAN 1050 cfm, 16 oz.
SPENCER 7350 cfm, 16 oz., 50 hp.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CONVEYOR OVERHEAD CHAIN
1700' JERVIS B. WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.

CORE BLOWERS
DEMMLER #2, 20# cores
DEMMLER #2K, 20# cores
REDFORD Bench types, horizontal or vertical clamping
CB15 55# cores, Universal blow plate
C.B. 10 up to 12# cores, 4½" draw
DEMMLER #4 up to 250# cores
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS ELECTRIC
THERMONIC INDUCTION MODEL 1800A

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
B & P CR 20-10
SUTTER SP 500F

CRANES
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—BONDACTOR #1250
BONDACTOR #1000

DIE CASTING
2—LAKE ERIE 800 ton Aluminum 58" x 89" die plates; 9# shot

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
AMERICAN 72 Bag; 3 hp

ELECTRIC MELTING FURNACES
SWINDELL 9' Dia. Top Charge cap. 3 ton steel 5 ton iron per hour, 3500 KVA 13800 volt transformer, complete in place

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V.
2—DETROIT "LFC" 350# Tapered shell 7200 V.

FLASK HOIST—ROLLER CONVEYOR
NATIONAL 24"; 8' long table

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
CAMPBELL HAUSFELD Staty. pot type
1—HEVI-DUTY HD-181-S Pot type, Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
FISHER RB100 Gas Fired Crucible
3—CAMPBELL HAUSFELD Gas Fired 625# brass hand tilt
1000# STROMAN DC double dipout w/complete controls

GRINDERS, SNAG
FOX 24" x 2" Single Wheel 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30" x 3" wheel

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ hp.

GRINDERS, MISC.
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
DESPATCH DT36 Pit type 42" x 40" Electric
LINDBERG 48" x 48" x 72" Elec., 1250°, box type.
BELLEVUE INDUSTRIAL GAS PUSHER
HAGAN OIL PUSHER

HOISTS
10 ton SHAW BOX electric hoist
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES JOLT SQUEEZE PIN LIFT
3—#165-6B MILWAUKEE table, 24" x 30"
2—#125-3 MILWAUKEE table, 21" x 27" —12" cyl.
2—OSBORN 712 PJ, 18" x 21" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
2—#2114 G. SPO table, 26" x 27"—11" cyl.

SPECIAL! FACTORY REBUILDING
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw, Flask size 25½" to 29" wide, 52" long. New 1951. WILL BE FACTORY REBUILT.

2—SPO 2302 Automatic Jolt Squeeze strip rollon, rolloff; NEW 1955

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
MILWAUKEE 214—Jolt Squeeze car type
2—MILWAUKEE 244 Jolt Squeeze car type head

JOLT ROLLOVER DRAWS
1020 JOHNSTON & JENNINGS, 60" x 50" table
JOHNSTON & JENNINGS 918, 44" x 64" table, 20" draw, rollout table
1—1500# HERMAN 26" x 48"
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
3—SPO 9032

JOLT PIN LIFTS
2—INTERNATIONAL 1200-8 26" x 27" table, 8" draw

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
2—#1 SIMPSON Mullers

SAND CUTTERS
1—ROYER MCZ-43

SAND SLINGERS
1—B&P Tractor, 19" heads
B&P 2 speed 40/25 hp. double belt

SAND SYSTEMS
2—NEWAYGO SUPER HANDY SANDY; like new

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
30" TANNEWITZ, 3 hp., 440 V.
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SHAKEOUTS
3' x 5' ROBBINS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
4' x 10' SIMPLICITY

SHOT BLAST
SLY #4, 20" x 20" w/dust collector

SPRUE CUTTERS
2—PERKINS #53 1½" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
TYLER ROTAP Testing Sieve w/screens

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.

WHEELABRATORS
2—42" x 48" AMERICAN Skip Loaders
1—27" x 36" AMERICAN Skip Loader
AMERICAN #2 Tablast S-20" tables, late
2—HOLLINGSWORTH 44" x 48" Wheelabrators

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc
OLIVER 72DR Router or borer
BOICE CRANE 12" Planer
2—OLIVER 182D, 15" Disc Sanders
1—WALLACE 8" Jointer
1—CRESCENT 24" Planer
TANNEWITZ 42" Band Saw
ONSRUD W-244 & W-240 Routers
8", 12" and 30" Jointers
16", 32", 36" Band Saws

WIRE STRAIGHTENERS
2—#2A CLIMAX ¼"

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AIR COMPRESSORS
COMPLETE STOCK—BURY, PENNSYLVANIA, SULLIVAN, INGERSOLL-RAND —SEND YOUR REQUIREMENTS

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure & Cent. Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—27" x 36" AMERICAN WHEELABRATOR TUMBLAST
1—36" x 42" AMERICAN WHEELABRATOR TUMBLAST
1—48" x 42" AMERICAN WHEELABRATOR TUMBLAST, w/loader
1—PANGBORN TABLAST, 8' Table, 2500#
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round

CONVEYORS
1—JEFFREY Car Type Mold, 23 cars, 109' track, cars 34" x 50"
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L Model VC-I
1—JEFFREY Ingot Mold, 3 compartment type 60' centers
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

CORE BLOWERS
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
2—WHITING #7, 7 ton cap. Never used. Fraction of cost!

DUST COLLECTORS
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

FURNACES—DIRECT ARC MELTING
1—250 Lb LECTROMELT, Side Charge
1—2000 lb. HEROULT, 3/60, 800 KVA
1—1¼ Ton HEROULT
1—3 Ton LECTROMELT, Door Charge
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC
1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AA, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING
1—3 KW, AJAX, Lab type, steel
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—17 KVA, LEPEL
1—75 KVA, AJAX, 2000# Brass
1—333 KW, AJAX, 1000# steel
1—50 KW GECO, Steel

REBUILT & GUARANTEED
BEARDSLEY & PIPER
#70 Speedmuller
15 cu. ft. batch with Cooling and Skip Loader

FURNACES—GAS & OIL
1—400# FISHER MNP, Gas Fired, Alum.
1—STROMAN, Gas, 1000# cap. Alum., auto control hyd. tilt.
1—STROMAN, Gas, 600 lb, "U" Type
1—1200# Brass, MNP, Oil

FURNACES—HEAT TREAT
1—2' x 3' x 6', gas fired, 1800° F.
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—20" x 36" L&N Draw electric
1—32" x 78" L&N Vapocarb, 83 KW
1—10" x 24" x 60" Gas, double end doors

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—J & J #918 40" x 48" Table 18" draw
3—J & J #815RB, 30" x 40" table, 1200#
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
1—HERMAN 3000#, 30" x 66" table
5—HERMAN 1500# to 30" x 48" tables
3—HERMAN 750# to 30" x 36" tables
2—INTERNATIONAL, 13" x 17" tables
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 57", 26" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30" w/air clamps, 1000#
2—TABOR 14" x 16" Rockover, 150#

Plain Jolt
2—DAVENPORT, table sizes 24" x 27", 30" x 30", 1200# to 1800#
1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
2—SPO #305, 750 lb
1—TABOR 17" x 20" table, portable
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift
2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5⅛" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#, 8" draw
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
5—SPO #2114P, 21" x 27" table, 600#
5—SPO #2136G, 21" x 30" table, 800#

Jolt Squeezers
2—INTERNATIONAL #12 LJS, 16" x 20" table
4—INTERNATIONAL #10 LJS, 16" x 20"
1—NICHOLS #12 P-P, portable, 600#
31—OSBORN #275PJ, #275J, 17" x 20" tables, 10" sq., 400#, stat. & port.
1—OSBORN #276J, 17" x 26" table, 13" squeeze, 500# port.
2—SPO #110J, 17" x 20" table, port.
1—SPO #113 J, 18¼" x 26" table, 13" cyl., port.

MATERIALS HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B & P #70 Speedmullor, 15 cu ft batch with cooling and skip loader
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
5—SIMPSON #0, U.D. 3' Dia, never used
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft. batch
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
1—SIMPSON #3, 8' Dia. Open Gear, 20-25 cu. ft. batch

LADLES AND POURING DEVICES
Bottom Pour
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top
Lip Pour
2—MODERN 20½" x 20½", covered, enclosed gear
1—WHITING 40" x 40" top dia. geared
Cylindrical
8—WHITING, 26" L x 25" dia, 1100# iron
7—WHITING 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron
Pouring Devices
11—WHITING, 650# to 2000# gross cap.

OVENS
1—COLEMAN, Oil, 1 compartment, 14'6" L x 80" H x 5' W
1—COLEMAN, Oil, Drawer Type, 70" L x 57" H x 48" W
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
1—COLEMAN, Gas, 2 compartments, rack type, each compartment: 7' H x 8' W x 10' D
1—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
1—GENRICH, Electric, Rack Type, 7' W x 7' H x 5'3" L
1—PORBECK, oil, 5 drawer core oven
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'

SAND CONDITIONING
2—B & P Screenarator, Model "S" & "M"
1—JEFFREY Sanditioner, Portable, 10-15 tons/hour, 2 H.P. Motor
1—LINK BELT Revivifer
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
1—ROYER, NDP 15-25 ton/hr, 2 HP
1—B & P Nite-Gang
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp

SAND CUTTERS
1—AMERICAN, 15 HP, 96/78 Reel
1—AMERICAN, 10 HP, 48" Reel

SAND SLINGERS
1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head

SHAKEOUTS AND SCREENS
1—SIMPLICITY Vibrex screen, 3' x 8'
1—ROBINS Vibrating Screen, 36" x 78"
1—SIMPLICITY 50" x 116" shakeout

TESTING EQUIPMENT
1—100,000 TINIUS OLSEN UNIVERSAL Hydraulic Testing Machine
1—500,000 lb. TINIUS OLSEN Hydraulic Compression Testing Machine
1—GOGAN Hand Operated Brinnel Hardness Tester

MISCELLANEOUS
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener 10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP

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AIR COMPRESSORS

1—AMERICAN Size 9 x 9, horiz. w/30 hp
1—KELLOG Model 350TV—5½ x 5", air cooled, 10 HP.

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes LC3, A, B, C, D, D-6 & E, 300, ¼, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ¼, 1 & 2 ton cap.
1—SHAW BOX 2 ton load lifter.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. cc. 10 x 7, 12 x 7, 14 x 7 16 x 8 buckets

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E. 10 to 100 lb Cores.
1—FEDERAL 40P-1 San-Flo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. cores.
3—MILWAUKEE #3A Bench Type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10,500 CFM w/blast gates.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—DETROIT Size CM — 4000# Cold Charge, 8000# Molten Metal, w/1000 KVA transformer.
1—DETROIT AA, 750# Cold Charge, 1500# molten w/400 KW transformer.
1—AJAX 50KW M.G. Set w/Furnaces—3000 cycle.
2—AJAX 20KW Hi Frequency Converters.
1—TOCCO 75KW M.G. Set—9600 cycles.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000, & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary, Sizes 100, 150, 200, & 550 cap. Gas or Oil.
1—LINDBERG #400 BBI hand tilt
1—LINDBERG #300, ATH, hand tilt.
1—STROMAN, Model "U," 600# Reverberatory Hand Tilt.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

HEAT TREAT FURNACES

2—L & N No. 957SUB48-10, Nitriding-Electric, 24" x 48" work area.
2—LINDBERG 2236EH pit type, 22" D x 36" H, elec.
1—LINDBERG 3360G17 pit type, 33" D x 60" H, gas
1—L & N "Homo" 14" D x 16" H, elec.
1—SURFACE Model LO 54 x 96 Box to 1850°.
1—LINDBERG 6084EH Pit Type 60" D x 84" H. 1250° Electric, 120KW.
1—INDUSTRIAL 3' x 21' Continuous "Circ Air"—1000° F.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.
3—U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder. 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, 3PO, MILWAUKEE, Portable & Stationary, 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & 8PO Portable & Stationary, 12" Cylinder.

Flask Jolt

1—J&J 50 x 72 Table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28A, 28" x 44" table.
1—DAVENPORT 28-8A, 29" x 40" table.
1—DAVENPORT #24SA, 24" x 40" table.
1—DAVENPORT #40SA, 40" x 60" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30".
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL TYPE G, Sizes 20" x 8", 24" x 10", and 30" x 8".
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table 10" Draw.
1—SPO 5050, Table 25" x 30", 10" draw
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

1—DAVENPORT 34AJS, 34" x 48" Table
3—INTERNATIONAL JDP 1600 X 16" draw, 36" x 36" Table.
2—J & J No. 685, 25 x 30 Table.
2—OSBORN #589, 25" x 30" Table.
2—MILWAUKEE #2642, 38" x 42" Table.
1—8PO #3058, 22" x 28" Table.
2—8PO #3070, Table 26" x 35"
1—TABOR, 22" x 32" table

Pin Lift

2—B & P Model AL 2428 Speed Draw.
1—MILWAUKEE #620 ND Power Push Off.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE No. 165, 24" x 30" table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORNS 714PJ, 20" x 31" Tables.
1—OSBORN 716PV, Table 22" x 34", 16" cyl.
4—INTERNATIONAL PKL, 17" x 28".
1—INTERNATIONAL PK-20, Size 20" x 8".
2—8PO 2192-R, 24" x 40" table, 19" cyl.
2—8PO #2114P, Table 21" x 27", 11" cyl.
2—8PO 2160-R, Table 24" x 30", 16" cyl.

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
1—12" W x 21' L x 4" deep pan
1—12" W x 26' L x 4" deep pan
2—18" W x 18' L x 4" deep pan

Roller

2500' MATHEWS 6", 12", 18" wide. 2 7/8" dia. roller, 1 1/16" hex shaft, 4" channel.
1500—MATHEWS 8" x 12" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Super Handy Sandy.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B & P #60, Speed Muller, 12 cu ft.
2—B & P #70, Speed Mullers, 18 cu ft.
1—BESSER Paddle Type, 30 cu. ft.
2—CLEARFIELD No. 610 w/skip hoist loaders. 10 to 14 cu ft batch.
1—CLEARFIELD #404, 4 cu. ft. batch
1—DRAVO-DOYLE 6 cu ft cap, Port.
1—LINK-BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH.
1—SIMPSON No. 1H Style UD—500#.
1—SIMPSON #0, style C, 175 lb.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.
2—B&P No. 3½ Mulbaro's.
1—FEDERAL 4 cu ft "Whirl-Mix" Muller.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP, NRS.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" & 60" Brush.

SANDSLINGERS

1—B & P Motive Jr., 300 cu ft tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.
6—B & P Tanks for speed slingers.

SHAKEOUTS & SCREENS

1—ALLIS-CHALMERS 5' x 8', portable.
2—LINK BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6' Model B
1—SIMPLICITY 4' x 8' Model D
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
2—ROBBINS 3' x 5' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20,000#.

SAND BLAST EQUIPMENT

2—AMERICAN 36" continuous Tumblasts
1—AMERICAN 20" x 27" w/dust collector.
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48".
1—AMERICAN No. 1-B Suction Cabinet.
1—AMERICAN #3 Tablast, 4—48" tables.
1—AMERICAN #1 Tablast, 7-14" tables.
1—PANGBORN #45, type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN 6LG-14 Multi-Table w/dust collector.

LIFTING MAGNETS

1—MILWAUKEE 45" dia. 230 volts
1—OHIO 25" dia., 230 volts

TUMBLING BARRELS

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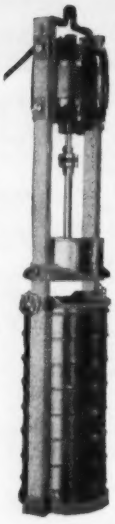

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FOUNDRY is edited primarily for management, production, technical and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve key foundry personnel on an individual or routed basis. A limited number of copies is supplied at no cost to educational institutions.
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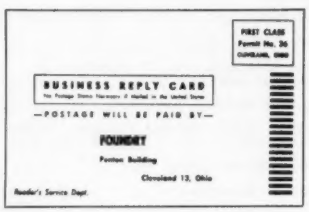

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Plastic Steel®

80% STEEL

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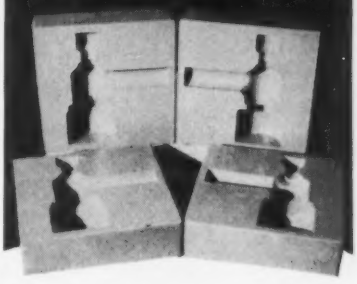

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126 ENDICOTT STREET, DANVERS, MASS.

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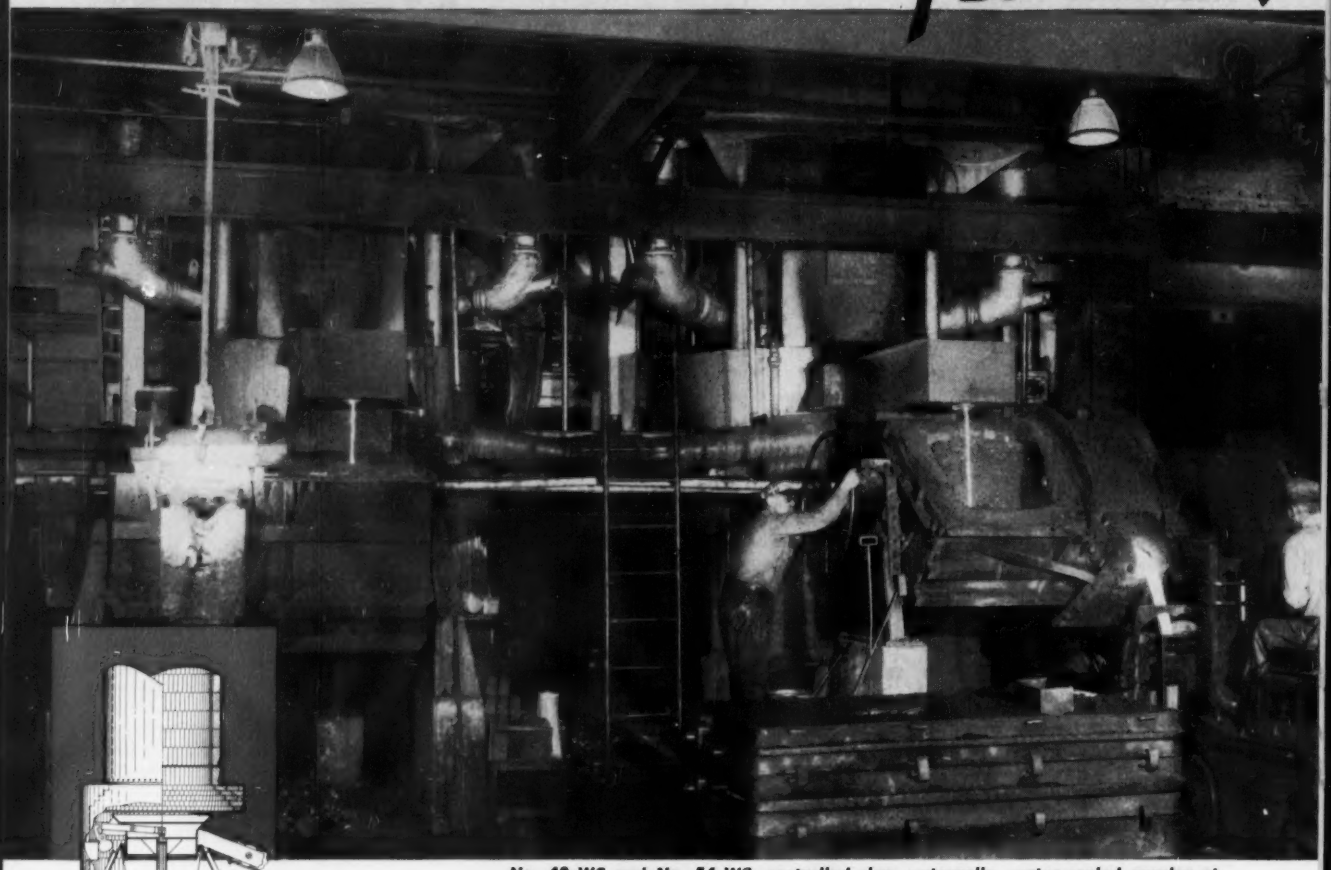
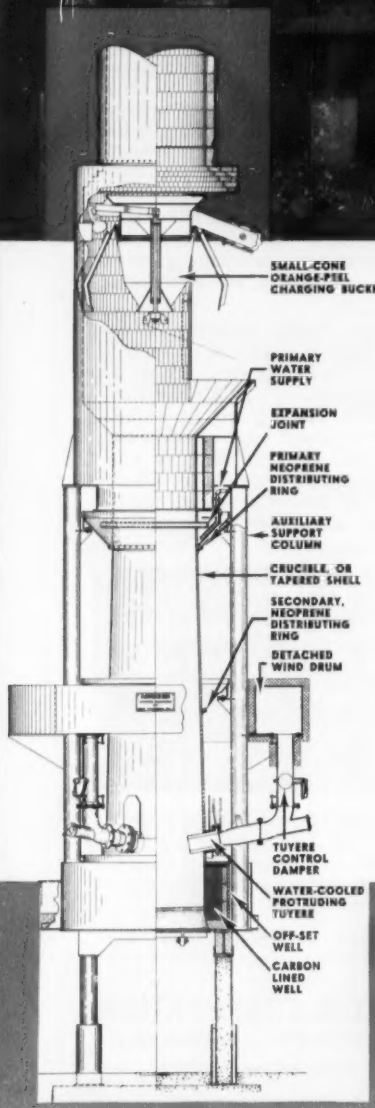
MODERN Water-Cooled Cupolas for FLEXIBILITY



No. 48-WC and No. 54-WC, controlled slag, externally, water-cooled cupolas at Neenah Foundry — operating with basic, acidic or neutral slags as desired.



JOBBING FOUNDRIES CAN AFFORD IT, TOO!

"can't afford not to MODERNIZE," is the reason as given by Neenah Foundry Company for their change to controlled-slag, externally, water-cooled cupolas. Operating with protruding copper, water-cooled tuyeres and melting directly against the steel shell over-all benefits include:

- ***Greater flexibility and closer control of the melting processes . . .***
- ***Prolonged periods of melting . . .***
- ***Decreased costs for refractory and maintenance . . .***

These major advantages and many more are being enjoyed throughout the major industries and by foundries large and small.

At Neenah Foundry the 8 and 11 TPH MODERN, water-cooled cupolas are operated with basic, acidic or neutral slags as desired. Cupolas remain in continuous operation from Monday morning 'til Friday night. All types of gray iron melted along with base iron for nodular.

All these and other benefits are covered in new bulletin 149-A. Use the coupon or write to Modern Equipment Co., Port Washington, Wis.

MODERN

NEW
Catalog 149-A
Mailed on Request

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Modern Equipment Co., Dept. F-4, Port Washington, Wis.
☐ Mail to my attention new catalog 149-A ☐ Mechanical charging ☐ Dust abatement control ☐ Pouring equipment

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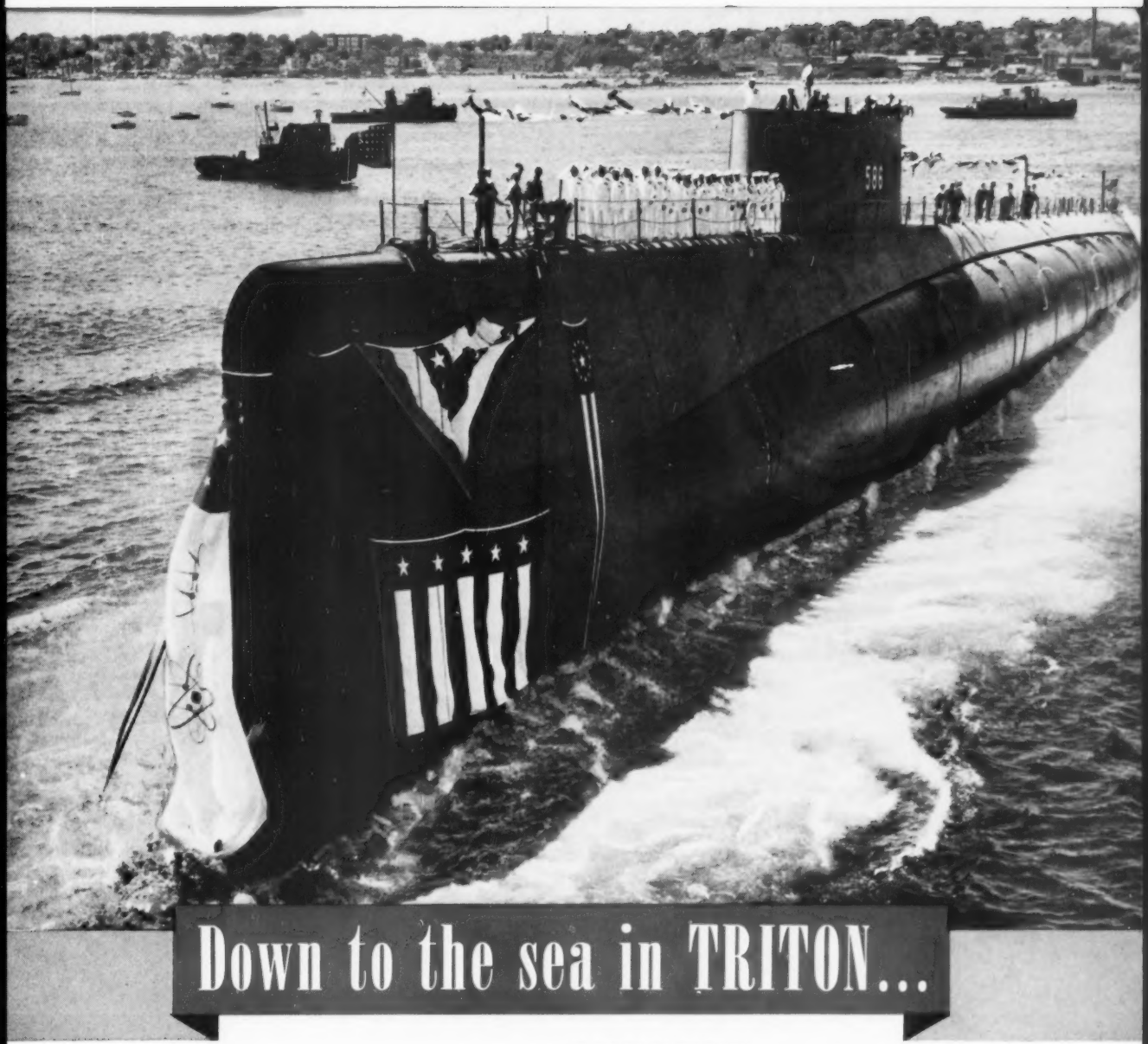

Down to the sea in TRITON...

CASTINGS MADE WITH STEVENS CO_2 BINDER

USS Triton, a radar picket submarine launched last August, is the largest undersea craft ever built and the first vessel in the world with twin nuclear reactor propulsion.

The Triton was built at Groton, Conn., by the Electric Boat Division of General Dynamics Corporation. Because high casting quality was an absolute essential, Stevens CO_2 Binder was used for casting such parts as sea valve bodies, manifold bodies, torpedo tube doors, and hatches.

With Stevens CO_2 Binder foundries get . . . Faster coating of sand grains, which means less binder used • Faster gassing of cores and molds • High scratch hardness • Longer bench life of sand mix • Improved shelf life of cores and molds • Better sand flowability • Minimum grain shedding • And the controlled quality that always gives the same results.

Call your local Stevens sales representative for full information.

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...Your Partner in Progress

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Sand Conditioners;
Phenolic Shell Molding Resins;
Phenolic, Amino and
Alkyd Core Binders

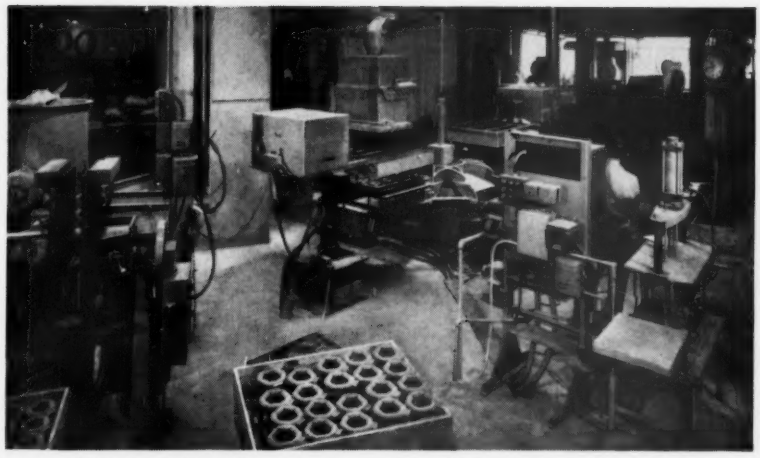
When close tolerances are vital

RCI FOUNDREZ INSURES ACCURACY IN HICA SHELL MOLDING PROCESS

Shreveport, La. —HICA, INC., reports that shell molds made with Reichhold's FOUNDREZ 7504 powdered phenolic resin produce "High Integrity CAstings" for manufacturers of chemical and milk processing equipment, aircraft, missile, pump, valve and burner parts. HICA pours stainless and other alloys on intricate jobs requiring extremely close tolerances.

HIGHEST DEPENDABILITY

In a recent interview Phillip R. Johnson, HICA shell molding foreman, said "The dependability of RCI's FOUNDREZ recently helped us supply a large order of complicated castings without a single reject by our customer. With FOUNDREZ, we are able to avoid the warpage and cracking frequently encountered with other resins. Nor have we experienced any problem that could be attributed to our use of FOUNDREZ."



HICA'S *shell molding department. Up-to-date methods and machines help produce accurate, economical castings.*

HICA *team ready to close cope and drag halves of plug valve handle adapter mold after cores have been set in place.*

ECONOMY IMPORTANT

Besides dependability and quality, economy played a significant part in HICA'S choice of FOUNDREZ. "The superior bonding qualities of RCI's FOUNDREZ 7504," said Mr. Johnson, "allow us to use less resin per pound of sand, affording us substantial savings in our production run. It's easy to see why we use FOUNDREZ exclusively in all our shell molding techniques."

VARIETY OF RESINS

Reichhold's FOUNDREZ 7500 series of powdered phenol-formaldehyde resins, designed especially for shell molding, includes:

FOUNDREZ 7500 — a general purpose phenol-formaldehyde resin. Features long flow and cure. This product is especially applicable to intricate-pattern work.

FOUNDREZ 7504— formulated for intermediate flow and long cure properties. Ideal for the jobbing shop where many different types of castings are made. May be employed on a variety of pattern contours.

FOUNDREZ 7506— has the shortest flow and fastest cure of the series. Compounded for high speed production of shells. Most suitable where foundry production involves long runs of a few types of castings.

If you would like further information on the FOUNDREZ 7500 series, write for Technical Bulletin F-3-R. Reichhold Chemicals, Inc., RCI Building, White Plains, New York.

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